

PHARMACOLOGY

Pharmacology

(Code: BMS0582)

Guideline

I. Course Introduction

104 classes comprise 56 for lecturing, 16 for class discussion, 32 for lab practice.

6.5 credits; 7th semester

II. Lecturing section

Department of Pharmacology, School of Basic Medicine, Tongji Medical College, Huazhong University of Science and Technology

III. Attribution

Pharmacology is a basic medical science which offers fundamental theories for rational usage of drugs to prevent and treat diseases. It is a double bridge that links medicine and pharmacy, basic medicine and clinical medicine. The goal of pharmacology is to clarify the action of drug and underlying mechanism, support rational use of drug, maximization of drug effect and avoidance from adverse effect, to develop new drug and novel purpose of existing drug, and to provide supports and methods for other life science researches.

IV. Requirements

Pharmacology is designed to provide based training for medical students for rational uses of drugs. Students are required to understand the pharmacodynamic properties (pharmacological effects, mechanism of action, clinical application and adverse reactions) and pharmacokinetic properties (absorption, distribution, metabolism and elimination) of the drugs frequently used clinically. As Pharmacology is also a practical course, students should not only learn the basic operational skills and related theories through the lectures, the experimental teaching and learning, but also should learn to design experiments, analyze data and improve their critical thinking.

V. Compulsory subject

Physiology; Pathology; Pathophysiology, etc.

Contents	Lecturing	Class Discussion	Self-study	Lab practice
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Drug Receptors & Pharmacodynamics	2			4
Pharmacokinetics & Pharmacodynamics: Rational Dosing & the Time Course	2			4
Drug Biotransformation	1			
Introduction to Autonomic Pharmacology	2			
Cholinoceptor -Activating & Cholinesterase-Inhibiting Drugs	1			4
Cholinoceptor-Blocking Drugs	1			
Adrenoceptor-Activating & Other Sympathomimetic Drugs	1			
Adrenoceptor Blocking Drugs	1			
Introduction to the Pharmacology of CNS Drugs	1			
Sedative-Hypnotic Drugs	1			
Antiseizure Drugs	1			4
Pharmacologic Management of Parkinsonism & Other Movement Disorders	1			
Antipsychotic Agents & Lithium	1	4		
Antidepressant Agents	1			
Opioid Analgesics & Antagonists	2			4
Nonsteroidal Anti-Inflammatory Drugs, Disease-Modifying Antirheumatic Drugs, Nonopioid Analgesics, & Drugs Used in Gout	2			
Diuretic Agents	2			4
RAAS inhibitors	2			
Agents Used in Cardiac Arrhythmias	3			4
Agents Used in Hyperlipidemia	1			
Drugs Used in Angina Pectoris	2	4		
Cardiac Glycosides & Other Drugs Used in Congestive Heart Failure	2			
Antihypertensive Agents	2			
Adrenocorticosteroids & Adrenocortical Antagonists	2			

Thyroid & Antithyroid Drugs	1			
Pancreatic Hormones & Antidiabetic Drugs	1			
Drugs used in asthma	2			
Drugs Acting on the Blood and the Blood-Forming Organs	2			
Drugs used in digestive diseases	2			
Drugs acting on the uterine smooth muscle				4
Beta-Lactam Antibiotics & Other Inhibitors of Cell Wall Synthesis	2			
Chloramphenicol, Tetracyclines, Macrolides, Clindamycin, & Streptogramins	2			
Aminoglycosides & Spectinomycin	2			
Sulfonamides, Trimethoprim, & Quinolones	2			
Cancer Chemotherapy	2			
Local anesthetics, Antihistamine drugs		4		
Antifungal and antiviral agents, Antituberculosics and Antimalarials		4		

VI. References

1. Textbook

Honghao Zhou, Textbook of Pharmacology, 1th, 2006

Laurence Brunton, Goodman and Gilman's The Pharmacological Basis of Therapeutics, 12th, 2010

Katzung BG, Basic & Clinical Pharmacology, 12th, 2011

2. Website

http://www.icourses.cn/coursestatic/course_2569.html

<https://www.ncbi.nlm.nih.gov/pubmed>

<http://link.springer.com/>

<http://onlinelibrary.wiley.com/>

VII. Course organization

20% experiment; 80% final examination

Chapter 1 Introduction

I. Objective and requirements

1. To master the definition of pharmacology;
2. To know the history of pharmacology;
3. To know the process of new drug discovery.

II. Key points

The definition of pharmacology, including the feature, goals and research method of pharmacology.

III. Lecturing contents and important points

1. The definition of pharmacology;
2. The definition of drugs and the differences between drugs and toxics;
3. The relationship between pharmacology and new drug research and development;
4. The process of new drug discovery involves preclinical studies, clinical trial and post-marketing research.

IV. Definitions

Pharmacology; pharmacodynamics; pharmacokinetics

V. Study questions

1. What is pharmacology?
2. Describe the process of new drug discovery.

Chapter 2 Pharmacokinetics

I. Objective and requirements

1. To master the common feature of pharmacokinetics, the various pharmacokinetic parameters their definition.
2. To know the process of drugs after administration, including absorption, distribution, biotransformation and excretion.

II. Key points

The common feature of pharmacokinetics, the various pharmacokinetic parameters their definition.

III. Lecturing contents and important points

1. the process of drugs after administration;
2. The various ways of drug absorption and factors that have effect on drug transportation across the cell membrane;
3. The dose-time curve, dose-response curve, basic pharmacokinetic parameters and their concept;
4. The feature of first-order and zero-order kinetics.
5. The steady state drug concentration after multiple dose.

6. Compartment model.

IV. Definitions

First-order elimination kinetics; zero-order elimination kinetics; Michaelis-Menten elimination kinetics; absorption; first pass elimination; distribution; biotransformation; excretion; bioavailability; CYP450; $t_{1/2}$; V_d ; CL ; C_{ss}

V. Study questions

1. What is the value of pK_a ?
2. What is the meaning of bioavailability? What is the equation for absolute and relative bioavailability and their corresponding use? What is first pass elimination and the significance of it?
3. What is the feature of zero-order elimination kinetics and how to calculate the $t_{1/2}$ of it?
4. What is the feature of first-order elimination kinetics and how to calculate the $t_{1/2}$ of it?
5. List the equation for the calculation of plasma clearance and apparent volume of distribution.
6. How to adjust the rate of administration in continuous drug injection at stable speed?
7. How to calculate the loading dose if we want reach the effective drug concentration in emergency?

Chapter 3 Pharmacodynamics

I. Objective and requirements

1. To master the dose-response relationship, the mechanism of drugs, the conception for receptors and ligands, the various types of receptors and the mechanism of transmembrane message conduction.
2. To know drug reaction.

II. Key points

dose-response relationship, the mechanism of drugs, the conception for receptors and ligands.

III. Lecturing contents and important points

1. Drug reaction and various types of adverse reaction.
2. Basic parameters from dose-response curve.
3. The relationship between the structure and activity of a drug.
4. The concept of agonist and antagonist.
5. The classification of receptors.

IV. Definitions

drug action; pharmacological effect; therapeutic effect; symptomatic treatment; adverse drug reaction; side reaction; toxic reaction; allergic reaction; dose-effect

relationship; minimal effective concentration; individual variability; potency; residual effect; structure activity relationship; agonist; antagonist; competitive antagonist

V. Study questions

1. What are drug action and pharmacological effect, respectively? What is the relationship between the selectivity of pharmacological effect and specificity of drug action?
2. What is the relationship between pharmacological effect and therapeutic effect and side reaction?
3. What information could be found in dose-response curve?
4. What is the meaning of therapeutic index and margin of safety?
5. What parameters could reflect the activity and affinity of drug, respectively?
6. What is the meaning of pD_2 and pA_2 value?
7. Describe the effect of competitive antagonist, non-competitive antagonist and partial agonist on the dose-response curve of an agonist separately.
8. What are agonist, antagonist and partial antagonist?

Chapter 4 Introduction to Autonomic Pharmacology

I. Objective and requirements

1. To master the physiological function of autonomic nerves system. To master the physiological effects of cholinergic receptors and adrenergic receptors. To master the classification of autonomic nervous system drugs.
2. To know the subtypes of M receptor and their characteristics, the subtypes of α , β receptors and their characteristics.

II. Key points

1. The physiological effects of cholinergic receptors and adrenergic receptors.
2. The classification of autonomic nervous system receptors and drugs.

III. Lecturing contents and important points

1. The classification of autonomic nervous system according to releasing neurotransmitters. The principle of synapse, neurotransmitter, receptor and effector. The biosynthesis, transport, storage, release and metabolism of norepinephrine and acetylcholine.
2. The classification of receptors: M (M_1 , M_2 and M_3), N (N_N and N_M) cholinergic receptors, α (α_1 , α_2) and β (β_1 , β_2 , β_3) adrenergic receptors, the distribution of each receptors.
3. The effects of norepinephrine and acetylcholine binding with their receptors.
4. The signal transduction of autonomic nervous system, including the biochemical process of the G protein coupling, e.g. the effects to phosphoesterase C, phosphoesterase D and adenosine cyclase activity, and then resulting in the production

of IP₃、 DAG. The process of receptors coupling with ion channels.

5. The action target of the autonomic nervous system drug: acting on receptors directly, affecting the synthesis, release, storage and uptake of neurotransmitters. The classification of autonomic nervous system drugs.

IV. Definitions

cholinergic nerve, noradrenergic nerve

V. Study questions

1. Sketch the classification and subtypes of autonomic nervous system receptors.
2. Describe the effects of autonomic nerves system receptors.

Chapter 5 Cholinoceptor Activating Drugs

I. Objective and requirements

1. To master the pharmacological effects, clinical uses and adverse effects of pilocarpine.
2. To know the M-like and N-like effects of acetylcholine.

II. Key points

1. The pharmacological effects, mechanism of action, clinical uses and adverse effects of pilocarpine.
2. The mechanism of pilocarpine on cyclospasm regulation of eyes.

III. Lecturing contents and important points

1. The M-like and N-like effects of acetylcholine. The application of methacholine and carbachol.
2. The activation of pilocarpine on M choline receptor of the iris sphincter and the ciliary muscle , the effects of pilocarpine on pupil and intraocular pressure.

IV. Definitions

cyclospasm(spasm of accommodation)

V. Study questions

1. Describe the pharmacological effects and clinical uses of pilocarpine.

Chapter 6 Cholinesterase-Inhibiting Drugs & Cholinesterase reactivator

I. Objective and requirements

1. To master the action properties, clinical uses of neostigmine. To master the detoxification and application of cholinesterase reactivator and atropine.
2. To know the toxication mechanism of the irreversible cholinesterase inhibitor organophosphates, the clinical symptoms of acute and chronic poisoning.

II. Key points

1. The action properties and clinical uses of neostigmine, the detoxification and application of cholinesterase reactivator.
2. The rescue of organic phosphates intoxication.

III. Lecturing contents and important points

1. The classification of cholinesterase, the steps of the hydrolyzed acetylcholine.
2. The reversible cholinesterase inhibitor neostigmine: pharmacokinetic process, action properties, clinical uses and adverse reactions.
3. The effects and applications of physostigmine, pyridostigmine, edrophonium chloride, galanthamine and tacrine

IV. Definitions

cholinesterase reactivator

V. Study questions

1. What are the clinical uses of neostigmine?
2. What are the mechanisms of neostigmine activating on skeletal muscles?
3. How to rescue the acute intoxication of organophosphates?

Chapter 7 M Cholinoceptor-Blocking Drugs

I. Objective and requirements

1. To master the pharmacological effects, mechanism of action, clinical uses and adverse reactions of atropine.
2. To know the action properties of anisodamine and scopolamine.

II. Key points

1. The pharmacological effects, mechanism of action, clinical uses and adverse reactions of atropine.
2. Compare the effects of anisodamine and scopolamine with atropine.

III. Lecturing contents and important points

1. The pharmacological effects, mechanism of action, clinical uses, adverse reactions and detoxification of atropine.
2. The pharmacological effects, action properties and clinical uses of anisodamine and scopolamine.
3. Action properties and clinical uses of synthesized spasmolytics.

IV. Definitions

Cycloplegia (paralysis of accommodation)

V. Study questions

1. Describe the pharmacological effects and clinical uses of atropine.
2. What is the mechanism of large dose atropine to relieve the microvasospasm?
3. Compare the action properties between anisodamine and scopolamine.

Chapter 8 Ganglionic blocking agents and skeletal muscular relaxants

I. Objective and requirements

1. To know the similarities and differences of succinylcholine and tubocurarine.
2. To understand the effects and applications of N_N receptor blocking agents.

II. Key points

1. The action properties of succinylcholine and tubocurarine.
2. The mechanisms of skeletal muscle relaxation of succinylcholine and tubocurarine. What should we pay attention when using succinylcholine and tubocurarine?

III. Lecturing contents and important points

1. The effects of skeletal muscular relaxants on N_M receptors.
2. The mode of action, action properties, drug interaction and clinical uses of depolarizing and non-depolarizing muscular relaxants.
3. The pharmacological effects, clinical uses and adverse effects of succinylcholine and tubocurarine.

IV. Definitions

ganglionic blocking agents, skeletal muscular relaxants

V. Study questions

1. Compare the effects between succinylcholine and tubocurarine.

Chapter 9 Adrenoceptor-Activating & Other Sympathomimetic Drugs

I. Objective and requirements

1. To master the pharmacological effects and clinical uses of epinephrine, norepinephrine and isoproterenol.
2. To know the classification of adrenoceptor-activating drugs.
3. To understand the pharmacological effects and clinical uses of dopamine, ephedrine, metaraminol and phenylephrine.

II. Key points

1. The pharmacological effects and clinical uses of epinephrine, norepinephrine and isoproterenol.
2. The similarities and differences of epinephrine, norepinephrine and isoproterenol.

III. Lecturing contents and important points

1. The basic chemical structure, structure-function relationship and classification of adrenoceptor-activating drugs.
2. The effects of norepinephrine on cardiovascular system, the clinical uses, adverse reactions and prevention of norepinephrine.
3. The effects of epinephrine on heart, different blood vessels, blood pressure, bronchial smooth muscle and metabolism. The clinical uses, adverse reactions and contraindications of epinephrine.
4. The effects of isoproterenol on heart, vessels, bronchial smooth muscle. The clinical uses, adverse reactions and contraindications of isoproterenol.
5. The effects of dopamine on α , β receptors, the characteristics of vasodilation by

activating DA receptors, and clinical uses.

6. The effects of ephedrine on cardiovascular system, bronchia smooth muscle and central nervous system, the clinical uses and the differences from epinephrine.

7. The action properties and applications of metaraminol, phenylephrine and methoxamine.

8. The effects and uses of β_1 receptor activating drug dobutamine.

IV. Definitions

catecholamines

V. Study questions

1. What are the pharmacological effects and clinical uses of epinephrine?
2. What are the pharmacological effects and clinical uses of dopamine?
3. What are the clinical uses of ephedrine?
4. Compare the pharmacological effects and clinical uses among epinephrine, norepinephrine and isoproterenol.
5. What are the characteristics of metaraminol action and uses?

Chapter 10 Adrenoceptor Blocking Drugs

I. Objective and requirements

1. To master the pharmacological effects and clinical uses of β -blockers propranolol and α_1 -receptor antagonist prazosin.
2. To know the classification of adrenoceptor blocking drugs.
3. To understand the structure-function relationship of β -blockers.

II. Key points

1. The pharmacological effects, clinical uses and adverse reactions of β -blockers propranolol and α_1 -receptor antagonist prazosin.
2. The effects of adrenoceptor blocking drugs on sympathomimetic drugs action.

III. Lecturing contents and important points

1. The pharmacological effects and clinical uses of α -blockers phentolamine and phenoxybenzamine.
2. The pharmacological effects and clinical uses of α_1 -receptor antagonist prazosin.
3. The effects of β -blockers on blood vessels, heart and bronchia smooth muscle, intrinsic sympathomimetic activity, clinical uses and adverse reactions.
4. The pharmacological effects, clinical uses and main adverse reactions of β -blockers propranolol
5. The action properties of selective β_1 receptor antagonist metoprolol and α 、 β -receptor antagonist labetalol.

IV. Definitions

adrenaline reversal, intrinsic sympathomimetic activity

V. Study questions

1. Describe the pharmacological effects and clinical uses of phentolamine.
2. What are the pharmacological effects and clinical uses of β -blockers?
3. Why both α -blockers and β -blockers can be used in hypertension?

Chapter 11 Introduction to the Pharmacology of CNS Drugs

I. Objective and requirements

1. To master the central neurotransmitters and receptors, synaptic transmission and the process.
2. To master the pharmacological characteristics of central nervous system (CNS).
3. To understand the cytological basis of CNS.

II. Key points

1. The important central neurotransmitters and receptors, synaptic transmission and the process.
2. The action steps of CNS drugs.

III. Lecturing contents and important points

1. The cytological basis of CNS: neuron, neuroglia cells, neural circuits, synapse and information transfer, ion channels.
2. Neurotransmitters and receptors: Ach, GABA, glutamic acid, NA, DA, 5-HT, Histamine, NPY and receptors.
3. The CNS drugs alter the physiological or pathological processes by acting on different steps (e.g. neurotransmitter, receptors, signaling transduction after receptors) of central synaptic transmission.

IV. Definitions

neurotransmitter, neuromodulator

V. Study questions

1. Describe the function of central Ach.
2. Describe the types and effects of GABA.
3. Describe the types and effects of glutamic acid.
4. Describe the pathways and functions of DA in CNS.

Chapter 12 Sedative-Hypnotic Drugs

I. Objective and requirements

1. To master the pharmacological effects, mechanism of actions, clinical uses and adverse reactions of benzodiazepines.
2. To know the characteristics and adverse reactions of barbiturates and other sedative-hypnotic drugs.

II. Key points

1. The pharmacological effects, clinical uses and adverse reactions of benzodiazepines.

2. The mechanism of actions of benzodiazepines and barbiturates.

III. Lecturing contents and important points

1. The definition and classification of sedative-hypnotic drugs.

2. The pharmacological effects (antianxiety, sedative-hypnotic effects, anticonvulsion, central muscle relaxation), mechanism of actions, clinical uses and pharmacokinetics of benzodiazepines. The dependency, addiction and other adverse reactions of benzodiazepines.

3. The pharmacological effects, mechanism of actions, clinical uses, adverse reactions, poisoning and rescue, drug interaction of barbiturates.

4. Other sedative-hypnotic drugs: chloral hydrate, hydroxyzine, meprobamate, buspirone, melatonin, etc.

IV. Definitions

sedative-hypnotics

V. Study questions

1. What are the common sedative-hypnotics? What other novel sedative-hypnotics are used in the clinic?

2. Compare the similarities and differentiations between diazepam and barbiturates (from pharmacological effects, mechanism of actions, clinical uses and adverse reactions).

3. Describe the effects and special clinical uses of chloral hydrate.

4. Why will barbiturates cause tolerance after long-term using?

Chapter 13 Antiseizure drugs

I. Objective and requirements

1. To master the feature, clinic use and adverse reaction of regular antiseizure drugs, such as sodium phenytoin, ethosuximide and diazepam.

2. To know the clinic use of carbamazepine, sodium phenobarbital and sodium valproate.

II. Key points

1. The feature, clinic use and adverse reaction of regular antiseizure drugs, such as sodium phenytoin, ethosuximide and diazepam.

2. The differences in the mechanism and clinic use of carbamazepine, sodium phenobarbital and sodium valproate.

III. Lecturing contents and important points

1. The epileptic seizure classification and pathophysiology.

2. The mechanism, pharmacological effect and adverse reaction of sodium phenytoin.

3. The mechanism, pharmacological effect, clinical use of ethosuximide, diazepam, carbamazepine, sodium phenobarbital and sodium valproate.

IV. Definitions

Antiseizure drugs.

V. Study questions

1. How to select the antiseizure drugs according to various epileptic seizure and what is the mechanism and clinical use of these drugs?
2. What are the precaution and adverse reaction of sodium phenytoine? And how to prevent the occurrence of these adverse reaction?

Chapter 14 Drugs for the treatment of parkinsonism & other movement disorders

I. Objective and requirements

1. To master the mechanism, clinical use and adverse reaction of levodopa;
2. To know the pharmacological effect and clinic use of carbidopa, selegiline, tolcapone, memantine, benztropine and bromocriptine.
3. To know drugs used in Alzheimer's disease (AD).

II. Key points

The mechanism, clinical use and adverse reaction of levodopa.

III. Lecturing contents and important points

1. The pathophysiology of Parkinson's disease (PD).
2. The mechanism, clinical use and adverse reaction of levodopa.
3. The benefits of combination use of carbidopa with levodopa.
4. The clinic use and adverse reaction of selegiline, tolcapone, memantine, benztropine and bromocriptine in PD.
5. Drugs used in AD.

IV. Definitions

On-off phenomenon of levodopa.

V. Study questions

1. Describe the pathophysiology of PD.
2. Describe the classification and mechanism of drugs used in PD and list one or two representative drugs of each category.

Chapter 15 Pharmacology of psychosis and mania

I. Objective and requirements

1. To master the pharmacological effects, mechanism of action, clinical uses and adverse effects of chlorpromazine.
2. To master the pharmacological effects, mechanism of action, clinical uses and adverse effects of lithium carbonate.
3. To know the classification of antipsychotic agents and the character of representative drug.

4. To know the classification of antimanic agents and the character of representative drug.

II. Key points

The pharmacological effects, mechanism of action, clinical uses and adverse effects of chlorpromazine and Lithium carbonate.

III. Lecturing contents and important points

1. The classification of antipsychotic agents and the character of representative drug.

2. The pharmacological effects, mechanism of action, clinical uses and adverse effects of chlorpromazine.

3. The classification of antipsychotic agents and the character of representative drug.

4. The pharmacological effects, mechanism of action, clinical uses and adverse effects of Lithium carbonate.

IV. Definitions

V. Study questions

1. Could you list the classification of antipsychotic agents (please list at least one representative drug)?

2. What are the pharmacological effects and mechanism of action of chlorpromazine?

3. Could you list the classification of antimanic agents (please list at least one representative drug)?

4. What are the pharmacological effects, mechanism of action, clinical uses and adverse effects of Lithium carbonate?

Chapter 16 Opioid Analgesics & Antagonists

I. Objective and requirements

1. To master the pharmacological effects, mechanism, clinical uses and adverse effects of opioid analgesics.

2. To master the pharmacological effects and clinical uses of opioid antagonists and partial agonists.

3. To know what drug dependence and drug abuse are.

4. To know opioid receptor types and the effects when the receptors are activated.

II. Key points

The pharmacological effects, mechanism, clinical uses and adverse effects of morphine and pethidine.

III. Lecturing contents and important points

1. The pharmacological effects, mechanism, clinical uses and adverse reaction of morphine.

2. The pharmacological effects, clinical use and adverse reaction of pethidine.

3. The characteristics of other opioid analgesics such as methadone, fentanyl and pentazocine .

4. The clinical uses of naloxone.
5. Drug dependence and drug abuse

IV. Definitions

Drug dependence; Abstinence

V. Study questions

1. Describe the pharmacological effects and clinical uses of morphine. Why can morphine be used in cardiac asthma instead of bronchial asthma?
2. Compare the differences of morphine and meperidine.

Chapter 17 Nonsteroidal Anti-Inflammatory Drugs, Antirheumatic Drugs and Drugs Used in Gout

I. Objective and requirements

1. To master the pharmacological effects, mechanism, clinical uses and adverse effects of nonsteroidal anti-inflammatory drugs.
2. To know the differences among nonsteroidal anti-inflammatory drugs.
3. To know the drugs used in treatment of rheumatoid arthritis.
4. To know the classification of drugs used in treatment of gout.

II. Key points

The pharmacological effects, mechanism, clinical uses and adverse effects of nonsteroidal anti-inflammatory drugs.

III. Lecturing contents and important points

1. The pharmacological effects, mechanism, clinical uses and adverse reaction of aspirin.
2. The characteristics of other nonsteroidal anti-inflammatory drugs, such as acetaminophen, ibuprofen and indomethacin.
3. The characteristics of COX-2 inhibitors.
4. Drugs used in treatment of rheumatoid arthritis.
5. Drugs used in treatment of gout.

IV. Definitions

Salicylism; Reye's syndrome

V. Study questions

1. Describe the pharmacological effects and clinical uses of aspirin. What are the adverse reactions of aspirin and how to prevent them?
2. Compare the analgesic action of morphine, aspirin, and atropine.
3. Compare the effects on temperature regulation of chlorpromazine and aspirin.

Chapter 18 Diuretics

I. Objective and requirements

1. To master the classification, pharmacological effects, mechanism, clinical uses of diuretics.

2. To know the pharmacological effect and clinical uses of mannitol.
3. To know physiological basis of diuretics.

II. Key points

the physiological basis and classification of diuretics, the pharmacological effect of diuretic agents, including furosemide, hydrochlorothiazide, spiro lactone and triamterene, the mechanism of diuretics.

III. Lecturing contents and important points

1. The physiological basis and classification of diuretics.
2. The mechanism, pharmacological effects, clinical uses and adverse reaction of high-efficacy diuretics.
3. The mechanism, pharmacological effects, clinical uses and adverse reaction of moderate-efficacy diuretics.
4. The mechanism, pharmacological effects, clinical uses and adverse reaction of low-efficacy diuretics.

IV. Definitions

Diuretics

V. Study questions

1. Compare the mechanism, site of action and influences on electrolytes of high, moderate and low-efficacy diuretics.
2. Compare the adverse reaction of high, moderate and low-efficacy diuretics.

Chapter 19 RAAS inhibitors

I. Objective and requirements

1. To master the pharmacological effects and mechanism, clinic uses and adverse reaction of RAAS inhibitors.
2. To know the physiological functions and the pathophysiology of RAAS.

II. Key points

The pharmacological effects and mechanism, clinic uses and adverse reaction of ACE inhibitors and AT₁ blockers.

III. Lecturing contents and important points

1. classification of RAAS inhibitors.
2. The pharmacological effects and mechanism, clinic uses and adverse reaction of ACE inhibitors.
3. The pharmacological effects and mechanism, clinic uses and adverse reaction of AT₁ blockers
4. The characteristics of aldosterone antagonist and renin inhibitor.

IV. Definitions

Aldosterone escape

V. Study questions

1. Describe the pharmacological effects, mechanism of action, clinical uses and major adverse effects of ACE inhibitors.

2. Compare the similarities and differences between ACE inhibitors and AT₁ blockers.

Chapter 20 Antiarrhythmic drugs

I. Objective and requirements

1. To master the pharmacological effects and mechanism, clinic uses and adverse reaction of antiarrhythmic drugs.

2. To understand the mechanism of arrhythmias.

3. To know the electrophysiological basis of heart

II. Key points

The pharmacological effects and mechanism, clinic uses and adverse reaction of commonly used antiarrhythmic drugs.

III. Lecturing contents and important points

1. classification of antiarrhythmic drugs.

2. The pharmacological effects and mechanism, clinic uses and adverse reaction of quinidine, lidocaine, propafenone, propranolol, amiodarone, verapamil and other commonly used antiarrhythmic drugs.

IV. Definitions

Afterdepolarization; Re-entry

V. Study questions

1. List the classification of anti-arrhythmic drugs.

2. What are the pharmacological effects, therapeutic uses and adverse effects of amiodarone?

3. What are the therapeutic uses of lidocaine, propranolol and verapamil?

Chapter 21 Antianginal drugs

I. Objective and requirements

1. To master the pharmacological effects and mechanism, clinic uses and adverse reaction of antianginal drugs.

2. To know therapeutical strategy in angina.

3. To understand the pathophysiology of angina.

II. Key points

The pharmacological effects and mechanism, clinic uses and adverse reaction of commonly used antiarrhythmic drugs.

III. Lecturing contents and important points

1. classification of antianginal drugs.

2. The pharmacological effects and mechanism, clinic uses and adverse reaction of

nitrates, β -blockers and calcium channel blockers.

IV. Definitions

Nitroglycerin tolerance

V. Study questions

1. What are the pharmacological effects and molecular mechanism of action of nitroglycerin?
2. Why can nitroglycerin be used in combination with β -blockers in the treatment of angina?
3. What are the pharmacological effects and therapeutic uses of calcium channel blockers?

Chapter 22 Agents used in hyperlipidemia

I. Objective and requirements

1. To master the pharmacological effects and mechanism, clinic uses and adverse reaction of agents used in hyperlipidemia.
2. To know therapeutical strategy in angina.
3. To understand the pathophysiology of angina.

II. Key points

The pharmacological effects and mechanism, clinic uses and adverse reaction of statins.

III. Lecturing contents and important points

1. classification of drugs used in hyperlipidemia.
2. The pharmacological effects and mechanism, clinic uses and adverse reaction of commonly used drugs in hyperlipidemia.

IV. Definitions

V. Study questions

1. Describe the classification of drugs used in hyperlipidemia.
2. What is the mechanism of action of statins in the treatment of hyperlipidemia?
3. What are the therapeutic uses and adverse effects of statins?

Chapter 23 Drugs Used in heart failure

I. Objective and requirements

1. To master the classification of drugs used in heart failure.
2. To master the mechanism of commonly used drugs in heart failure.
3. To master the pharmacological effects and mechanism, clinic uses and adverse reaction of glycosides.
4. To understand the pathophysiology of heart failure.

II. Key points

The mechanism of ACE inhibitors, AT₁ blockers, β -blockers, diuretics for treating

heart failure. The pharmacological effects and mechanism, clinic uses and adverse reaction of glycosides.

III. Lecturing contents and important points

1. Classification of drugs used in heart failure.
2. The mechanism of commonly used drugs for treating heart failure.
3. The pharmacological effects and mechanism, clinic uses and adverse reaction of glycosides.

IV. Definitions

V. Study questions

1. Classify the drugs in the treatment of congestive heart failure.
2. What are the pharmacological effects, mechanism of action, therapeutic uses of cardiac glycosides?
3. What are the adverse effects of cardiac glycosides? And how the adverse effects can be treated?

Chapter 24 Antihypertensive Agents

I. Objective and requirements

1. To master the classification of drugs used in hypertension.
2. To master the mechanism of first-choice drugs in hypertension.
3. To know the clinical evaluation of drugs used in hypertension.
4. To understand the pathophysiology of heart failure.

II. Key points

The classification of first-choice drugs used in hypertension. The mechanism of commonly used drugs in hypertension.

III. Lecturing contents and important points

1. Classification of drugs used in hypertension.
2. The mechanism and clinical evaluation of commonly used drugs for treating hypertension.
3. The pharmacological effects and mechanism, clinic uses and adverse reaction of glycosides.
4. The principles of hypertensive drugs application

IV. Definitions

V. Study questions

1. Classify antihypertensive drugs.
2. List the first-choice drugs for treating hypertension and describe their mechanisms.
3. What are the mechanism of action and adverse effects of clonidine?

Chapter 25 Adrenocorticosteroids & adrenocortical antagonist

I. Objective and requirements

1. To master the pharmacological effect, clinical use, adverse reaction and precaution of glucocorticoids.
2. To know the mechanism of glucocorticoids.

II. Key points

The mechanism, pharmacological effects, clinical use, adverse reaction and precaution of glucocorticoids.

III. Lecturing contents and important points

1. The physiological effect, pharmacological effect, clinical use, adverse reaction and precaution of glucocorticoids.
2. The mechanism of glucocorticoids.
3. The pharmacokinetics of glucocorticoids.

IV. Definitions

The withdrawal reaction of glucocorticoids.

V. Study questions

1. Describe the pharmacological effect of glucocorticoids.
2. Describe the anti-inflammatory mechanism of glucocorticoids.
3. Describe the adverse reaction of glucocorticoids.

Chapter 26 Thyroid & antithyroid drugs

I. Objective and requirements

1. To master the clinic use of thyroid drugs.
2. To master the classification of antithyroid drugs.
3. To know the mechanism, pharmacological effect, clinic use and adverse reaction of antithyroid drugs.

II. Key points

The clinic use of thyroid drugs; the mechanism and clinic use of antithyroid drugs; the treatment of thyroid storm.

III. Lecturing contents and important points

1. The classification, synthesis, storage, secretion and regulation of thyroid hormone.
2. The pharmacological effect, clinic use and adverse reaction of thyroid drugs;
3. The classification of antithyroid drugs.
4. The mechanism, pharmacological effect, clinic use and adverse reaction of thioureas.
5. The mechanism, pharmacological effect, clinic use and adverse reaction of iodide at low dose and high dose, respectively.
6. The mechanism, pharmacological effect, clinic use, adverse reaction and precaution of radio active iodine.

IV. Definitions

Hyperthyroidism; hypothyroidism.

V. Study questions

1. Why large dose of iodides could be used in patient with hyperthyroidism before thyroidectomy.
2. Describe the mechanism and clinic use of thioureas.

Chapter 27 Pancreatic hormones & antidiabetic drugs

I. Objective and requirements

1. To master the mechanism, clinical use and precaution of insulin and biguanides.
2. To know the feature of sulfonylureas and thiazolididiones.

II. Key points

Insulin resistance; the mechanism, clinical use and precaution of insulin and biguanides; the proper use of antidiabetic drugs.

III. Lecturing contents and important points

1. The mechanism, pharmacological effect, clinical use and precaution of insulin.
2. The classification of oral antidiabetic drugs.
3. The mechanism, pharmacological effect, clinical use of biguanides.
4. The mechanism, pharmacological effect, clinical use of sulfonylureas, thiazolididiones and α -glucosidase inhibitors.
5. The proper use of antidiabetic drugs.

IV. Definitions

Insulin resistance.

V. Study questions

1. Describe the mechanism and pharmacological effect of insulin.
2. Describe the mechanism and pharmacological effect of metformin.
3. Describe the mechanism of glyburide.

Chapter 27 Drugs for respiratory disorders

I. Objective and requirements

1. To master the classification of drugs used in asthma.
2. To know the mechanism and pharmacological effect of theophylline.
3. To know the classification of antitussives and expectorants.

II. Key points

The classification of drugs used in asthma; the mechanism, pharmacological effect, clinic use and adverse reaction of each category of drugs used in asthma.

III. Lecturing contents and important points

1. The pathophysiology of asthma.
2. classification of drugs used in asthma.

3. The mechanism, pharmacological effect, clinical use of theophylline.
4. The mechanism, pharmacological effect, clinical use of sympathomimetic agent, antimuscrinic agent, corticosteroids and cromolyn.
5. The feature of zafirlukast, zileuton and omalizumab.

IV. Definitions

antiasthmatic drugs; antitussives; expectorants.

V. Study questions

1. Describe the classification of drugs used in asthma and list the representative drug of each category.
2. Describe the mechanism and pharmacological effect of theophylline.

Chapter 28 Drugs Acting on the Blood and the Blood-Forming Organs

I. Objective and requirements

1. To master the anticoagulant characteristics of heparin and dicoumarin. To master the effects and uses of antiplatelet agents. To master the effects and uses of fibrinolytics.
2. To know the anti-anemia effects and uses of iron and folic acid. To know the characteristics of SK, UK and t-PA. to know the classification and representative drugs of antiplatelet agents.

II. Key points

1. The anticoagulant characteristics and clinical uses of heparin and dicoumarin.
2. The characteristics of SK, UK and t-PA.
3. The mechanisms of antiplatelet agents.

III. Lecturing contents and important points

1. Blood coagulation process, the anticoagulant characteristics, mechanisms, uses and adverse effects of heparin and dicoumarin.
2. The effects of antiplatelet agents on aggregation, release of platelet; the clinical uses and therapeutic evaluation of antiplatelet agents.
3. Anticoagulation effects and clinical uses of vitamin K, aminomethylbenzoic acid and tranexamic Acid.
4. The anemia type, the clinical uses of iron, folic acid and vitamin B12.
5. The pharmacological effects and clinical uses of dextral volume extender dextran, the action properties, adverse effects and notification of dextran with different molecular weight.
6. The pharmacological effects and clinical uses of leukocyte hyperplasia drugs.

IV. Definitions

antiplatelet agents, anticoagulant

V. Study questions

1. Describe the anticoagulant mechanism of heparin, what are the advantages of low molecular weight heparin.
2. Describe the anticoagulant mechanism and clinical uses of coumarins.

3. Describe the antiplatelet action mechanism of aspirin, ticlopidine.
4. Describe the pharmacological effects and clinical uses of iron and folic acid.

Chapter 29 Drugs used in digestive diseases

I. Objective and requirements

1. To master the classification of peptic ulcer drugs, the mechanisms and clinical uses of main drugs.
2. To know the drug combination to treat peptic ulcer. To know the pharmacological effects, mechanisms and clinical uses of antemetics and prokinetic agents.

II. Key points

1. The classification of peptic ulcer drugs, the mechanisms and clinical uses of major drugs in each class.
2. The radical cure of peptic ulcer.

III. Lecturing contents and important points

1. The pathogenesis of peptic ulcer.
2. The mechanisms and characteristics of common peptic ulcer drugs: antiacids, gastric acid secretion inhibiting drugs (M-receptor antagonists, H₂ receptor antagonists, gastrin receptor antagonists, proton pump inhibitors), mucosal protective drugs, anti-helicobacter pylori drugs.
3. The characteristics of digestants.
4. The classification, mechanisms and clinical uses of antemetics and prokinetic agents.
5. The classification and clinical uses of laxative.
6. The pharmacological effects and clinical uses of antidiarrheics.
7. The pharmacological effects and clinical uses of hepatic protection and cholagogue.

IV. Definitions

proton pump inhibitors; antemetics; prokinetic agents

V. Study questions

1. describe the classification, representative drugs and mechanisms of agents using in peptic ulcer. How to cure peptic ulcer radically?
2. Compare the mechanisms and characteristics of different antemetics.

Chapter 30 Antimicrobial Agents

I. Objective and requirements

1. To master the mechanisms of action of antibiotics and the mechanisms of bacterial resistance to antibiotics.
2. To know how to select an antimicrobial Agent.
3. To know the misuses of antibiotics.

II. Key points

The mechanisms of action of antibiotics and the mechanisms of bacterial resistance to antibiotics

III. Lecturing contents and important points

1. Definition and characteristics of antibiotics;
2. Classification and mechanism of action of antibiotics;
3. Bacterial resistance to antimicrobial agents ;
4. Selection of an antimicrobial agent;
5. Misuses of antibiotics;

IV. Definitions

Antibiotics

V. Study questions

1. Please describe the mechanisms of action of antibiotics?
2. Please describe the mechanisms of bacterial resistance to antibiotics ?

Chapter 31 Beta-Lactam antibiotics and other inhibitor of cell wall synthesis

I. Objective and requirements

1. To master the mechanism of action of, the mechanisms of bacterial resistance to, the clinical uses of, and the adverse reactions of penicillins and cephalosporins.
2. To know the benefit of 3rd generation compared to 1st generation cephalosporins.
3. To know the mechanism and the antibacterial activity of other beta-lactam drugs (including monolactams, beta-lactamase inhibitors, carbapenems).
4. To know the mechanism of action and the adverse reaction of vancomycin.

II. Key points

The mechanism of action, clinical uses, and adverse reactions of penicillins and cephalosporins; the mechanisms of bacterial resistance to penicillins and cephalosporins.

III. Lecturing contents and important points

1. The mechanism of action, clinical uses and adverse reactions of penicillins and cephalosporins. The mechanisms of bacterial resistance to penicillins and cephalosporins.
2. The benefit of 3rd generation compared to 1st generation cephalosporins.
3. The mechanism and the antibacterial activity of other beta-lactam drugs (including monolactams, beta-lactamase inhibitors, carbapenems).
4. The mechanism of action and the adverse reaction of vancomycin.

IV. Definitions

Disulfiram-like reactions

V. Study questions

1. Please list the classification of beta-lactams and representative drugs.
2. What is the mechanism of action of penicillins?
3. What is the benefit of 3rd generation compared to 1st generation cephalosporins?
4. What are the adverse reactions of penicillins and cephalosporins?

Chapter 32 Aminoglycosides

I. Objective and requirements

1. To master the mechanism of action and the adverse effect of aminoglycosides.
2. To know the mechanisms of bacterial resistance to aminoglycosides.
3. To know the character of some specific agents of aminoglycosides (streptomycin, gentamicins, tobramycin, amikacin, netilmicin, kanamycin, neomycin).

II. Key points

The mechanism of action and the adverse effect of aminoglycosides

III. Lecturing contents and important points

1. The mechanism of action of aminoglycosides.
2. The mechanisms of bacterial resistance to aminoglycosides.
3. The adverse effect of aminoglycosides.
4. The characteristics of some specific agents of aminoglycosides (streptomycin, gentamicins, tobramycin, amikacin, netilmicin, kanamycin, neomycin).

IV. Definitions

V. Study questions

1. What is the mechanism of action of aminoglycosides?
2. What is the adverse effect of aminoglycosides?

Chapter 33 Macrolides, clindamycin and polypeptide antibiotics

I. Objective and requirements

1. To master the mechanism of action, antimicrobial activity and clinical uses of macrolides.
2. To know the adverse reactions of macrolides.
3. To know the mechanism of action, antimicrobial activity, clinical uses and adverse reactions of clindamycin.
4. To know the clinical uses and adverse reactions of bacitracin and polymyxin

II. Key points

The mechanism of action and antimicrobial activity of macrolides.

III. Lecturing contents and important points

1. The mechanism of action, antimicrobial activity, clinical uses and the adverse reactions of macrolides.
2. The character of some specific agents of macrolides (erythromycin, clarithromycin, azithromycin, etc.).
3. The mechanism of action, antimicrobial activity, clinical uses and adverse reactions of Clindamycin.
4. The clinical uses and adverse reactions of bacitracin and polymyxin.

IV. Definitions

V. Study questions

1. What is the mechanism of action of macrolides?
2. what are the antimicrobial activity and clinical uses of macrolides?
3. what are the antimicrobial activity and adverse reactions of clindamycin?

4. what are the clinical uses and adverse reactions of polymyxin E (COLISTIN)?

Chapter 34 Tetracyclines and chloramphenicol

I. Objective and requirements

1. To master the mechanism of action and the adverse reactions of chloramphenicol and tetracyclines.
2. To know the antimicrobial activity and clinical uses of chloramphenicol and tetracyclines.

II. Key points

The mechanism of action of chloramphenicol and tetracyclines; the adverse reactions of chloramphenicol and tetracyclines.

III. Lecturing contents and important points

1. The mechanism of action, antimicrobial activity, clinical uses and the adverse reactions of chloramphenicol.
2. The mechanism of action, antimicrobial activity, clinical uses and the adverse reactions of tetracyclines.

IV. Definitions

V. Study questions

1. What is the mechanism of action of chloramphenicol and tetracyclines?
2. What are the antimicrobial activity and clinical uses of chloramphenicol and tetracyclines?
3. What are the adverse reactions of chloramphenicol and tetracyclines?

Chapter 35 Artificial Synthetic Antibacterial Drugs

I. Objective and requirements

1. To master the mechanism of action and the adverse reactions of sulfonamides and quinolones, the antimicrobial activity and clinical uses of quinolones.
2. To know the antimicrobial activity and clinical uses of sulfonamides.

II. Key points

The mechanism of action and the adverse reactions of sulfonamides and quinolones

III. Lecturing contents and important points

1. The mechanism of action, the antimicrobial activity, clinical uses and adverse reactions of sulfonamides.
2. The reasons of combination of sulfonamides with trimethoprim;
3. The mechanism of action, the antimicrobial activity, clinical uses and adverse reactions of quinolones.

IV. Definitions

V. Study questions

1. What is the mechanism of action of sulfonamides?
2. What are the antimicrobial activity and clinical uses of sulfonamides?
3. What are the adverse reactions of sulfonamides?
4. What are the reasons of combination of sulfonamides with trimethoprim?
5. What is the mechanism of action of quinolones ?

6. What is the antimicrobial activity and clinical uses of quinolones?
7. What is the adverse reactions of quinolones?

Chapter 36 Cancer chemotherapy

I. Objective and requirements

1. To master the classification of antineoplastics according to biochemistry mechanisms.
2. To know the clinical uses and toxicities of specific antineoplastics.

II. Key points

The classification of antineoplastics according to biochemistry mechanisms.

III. Lecturing contents and important points

The classification of antineoplastics; The mechanism, the clinical uses and toxicities of antineoplastics

IV. Definitions

Growth Fraction; Cell cycle specific agents; Cell cycle nonspecific agents

V. Study questions

1. According to biochemistry mechanisms, could you list the classification of antineoplastics?
2. What are the toxicities caused by antineoplastics?