

SCBM 352 Pharmacology 1 Academic Year 2569 (2026)

Course description

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SCBM 352 Pharmacology 1

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Principles and mechanisms of dysfunction and diseases of cardiovascular and urinary system, general sensation, pain, analgesics, anesthetics, motor disorders and treatment, neurological disorders and treatment, psychiatric disorders and treatment, sleep, drugs for sleep disorders, epilepsy and treatment, learning memory and dementia

Course objectives

At the end of this course, the students will be able to

1. Describe the etiology and basic mechanism underlying the common dysfunctions and diseases of cardiovascular, urinary and neurological systems.
2. List and describe the targets and mechanisms of action, clinical indication and adverse effects of drugs acting on cardiovascular, urinary and neurological systems.
3. Apply and integrate knowledge of disease etiology and pharmacology for discussion of prospective drug research.

Course coordinator

Assoc. Prof. Dr. Nattinee Jantaratnotai, Ph.D., MD. nattinee.jan@mahidol.ac.th

Instructors

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| 1. Assoc. Prof. Dr. Nattinee Jantaratnotai, Ph.D., MD. | NJ |
| 2. Assoc. Prof. Dr. Noppawan Phumala Morales, Ph.D. | NM |
| 3. Assoc. Prof. Dr. Ruedee Hemstapat, B.Sc. (Pharm), Ph.D. | RH |
| 4. Asst. Prof. Dr. Pimtip Sanvarinda, M.D., Ph.D. | PM |
| 5. Asst. Prof. Dr. Pansakorn Tanratana, MD., Ph.D. | PT |
| 6. Dr. Somchai Yanrojana, M.D., Ph.D. | SY |

References

1. Brunton LL, Knollmann BC. Goodman & Gilman's The Pharmacological Basis of Therapeutics, 14th ed. McGraw-Hill Education. 2022
(<https://accessmedicine.mhmedical.com/book.aspx?bookid=3191>)
2. Vanderah TW. Katzung's Basic & Clinical Pharmacology, 16th Edition. McGraw-Hill; 2024
(<https://accessmedicine.mhmedical.com/book.aspx?bookid=3382>)
3. Rang HP, Dale MM, Ritter JM and Moore PK. (2023). Rang & Dale's Pharmacology, 10th ed. Elsevier.

Additional research papers may be distributed to students for reading before class.

Assessment

1. Written examination (70%)
2. Performance evaluation (30%)
 - Quiz I, II, III – 24%
 - Responsibility/following all rules and regulations – 6%

Score and grade

The contents of lectures are accounted for 70% (written examination), student's learning performance in the class is 25%, and responsibility (following all rules and attendance) 5%. The final grade will be ranked from F to A, basically based on standard criterion and the rubric score.

Grading will be done using percent points.

Grade

A	$\geq 80\%$
B+	75 - 79%
B	70 - 74%
C+	65 - 69%
C	60 - 64%
D+	55 - 59%
D	50 - 54%
F	below 50%

**** Students must attend more than 80% of lectures to be**

allowed to take the examination. **

Schedule SCBM 352-2026

Date: 3 September 2026 – 15 October 2026

Time: Tue & Thur 09.00-12.00 **Venue:** P401

Date	Time	Topic	Lecturer
3 Sep	8.45-9.00 9.00-12.00	Orientation L1: Pharmacology of hemostasis I L2: Pharmacology of hemostasis II L3: Pharmacology of cardiac rhythm	NJ PT
8 Sep	9.00-12.00	L4: Pharmacology of vascular tone L5: Pharmacology of volume regulation L6: Pharmacology of cardiac contraction	SY
10 Sep	9.00-12.00	L7: Pharmacology of hematopoiesis L8: Pharmacology of lipid metabolism Conference 1: Formative evaluation & quiz	NM PT, NM, SY
15 Sep	10.30-12.00	Examination I (L1-8)	TA
17 Sep	9.00-12.00	L9-10: Drugs used in treatment of GI diseases L11: Introduction to CNS pharmacology	SY NJ
22 Sep	9.00-12.00	L12-13: Drugs for respiratory disorders L14: Drugs for movement disorders	PM
24 Sep	9.00-12.00	L15: Local anesthetics L16: General anesthetics Conference 2: Formative evaluation & quiz	RH SY, PM, NJ, RH
29 Sep	10.30-12.00	Examination II (L9-16)	TA
1 Oct	9.00-12.00	L17: Antidepressants (1.5h) L18: Antipsychotic drugs (1.5h)	NJ NJ
6 Oct	9.00-12.00	L19: Antiepileptic drugs L20: Anxiolytic drugs L21: Drugs for dementia	NJ
8 Oct	9.00-12.00	L22: NSAIDs L23: Opioids Conference 3: Formative evaluation & quiz	RH RH, NJ
15 Oct	10.30-12.00	Examination III (L17-24)	TA

L1-2: Pharmacology of hemostasis I-II

Lecturer: Pansakorn Tanratana, M.D., Ph.D., Pharmacology, Faculty of Science

Learning Objectives:

Students should be able to:

1. Explain the fundamental concept of hemostasis
2. Describe platelet functions and mechanism of platelet activation induced by various agonists.
3. Classify and discuss the clinical uses of different classes of antiplatelet drugs.
4. Discuss the pharmacological basis of the anticoagulants
5. Discuss the pharmacological basis of fibrinolytic drugs
6. Discuss the clinical applications of all drugs involved in coagulation

Content Outline:

1. Physiology of hemostasis
2. Pathogenesis of thrombosis
3. Agonists and mechanisms of platelet activation
4. Antiplatelet drugs: mechanisms, clinical uses, and adverse effects
 - 4.1 Cyclooxygenase inhibitors
 - 4.2 Phosphodiesterase inhibitors
 - 4.3 ADP receptor pathway inhibitors
 - 4.4 GPIIb/IIIa antagonists
5. Blood coagulation cascade
6. Basic pharmacology of anticoagulants.
 - 6.1 Indirect thrombin inhibitors
 - 6.2 Direct thrombin inhibitors
7. Basic pharmacology of the fibrinolytic drugs
8. Clinical pharmacology of drugs used to prevent clotting used in bleeding disorders

Learning Organization:

1. Studying materials provided in advance.
2. Lecture 100 minutes.
3. Question and answers 10 minutes.

Learning Materials:

PowerPoint lecture presentation

References:

1. Armstrong AW, Golan DE. Pharmacology of hemostasis and thrombosis. In: D E. Golan, A H Tashjian Jr, E J Armstrong, A W Armstrong, editors. Principles of pharmacology: the pathophysiologic basis of drug therapy. 2nd ed. Baltimore: Lippincott Williams & Wilkins; 2008. p. 387-409.
2. Hilal-Dandan R. Renin and angiotensin. In: L L. Brunton, editor. Goodman & Gilman's The Pharmacological Basis of Therapeutics, 12th ed. New York: McGraw-Hill ;2011.
3. Katzung BG, Chatterjee K. Vasodilators & the treatment of angina pectoris. In: B G. Katzung, S B. Masters, A J. Trevor, editors. Basic & Clinical Pharmacology, 12th Ed.: New York: McGraw-Hill ; 2012.

L3: Pharmacology of cardiac rhythm

Lecturer: Pansakorn Tanratana, M.D., Ph.D., Pharmacology, Faculty of Science

Learning Objectives:

Students are able to

1. Describe simple pathogenesis of common cardiac arrhythmias
2. Classify antiarrhythmic agents according to their mechanisms of action.
3. Explain the toxicity of the prototype antiarrhythmic agents.

4. Discuss principle in the clinical use of antiarrhythmic drugs

Content Outline:

1. Mechanisms of arrhythmias
2. Basic pharmacology of the antiarrhythmic drugs
3. Classification of the antiarrhythmic drugs
4. Mechanisms of action, side effects of antiarrhythmic drugs
5. Principles in the clinical use of antiarrhythmic drugs

Learning Organization:

1. Studying the learning materials provided in advanced
2. Lecture 50 minutes
3. Question and answers 10 minutes

Learning material provided:

1. Transcripts of the lecture outline
2. Slide from power-point presentation

References:

1. Hume J.R. and Grant A.O.: Agents Used in Cardiac Arrhythmias. Katzung: Basic and Clinical Pharmacology, 11th Ed (2009) p 225-249. Editors: Katzung B.G. Lange-Medical McGraw-Hill Companies.
2. Roden D.M: Antiarrhythmic Drugs; Goodman & Gilman's. The Pharmacological Basis of Therapeutics, 11th Ed. (2006) p 899-932. Editors: Bruton L.L., Lazo J.S. and Parker K.L. McGraw-Hill Companies.

L4: Pharmacology of vascular tone

Lecturer: Somchai Yanrojana, Pharmacology, Faculty of Science

Learning Objectives:

Students should be able to:

1. Explain the mechanism of regulation of vascular tone.
2. Describe the mechanisms of vasodilators.
3. Distinguish the classification of vasodilators.
4. Describe the clinical uses of vasodilators.

Content Outline:

1. Physiology of blood vessel and mechanism of contraction and relaxation of blood vessel
2. Classification of vasodilators
3. Site of action and mechanism of action of vasodilators
4. Pharmacological effects, pharmacokinetics, adverse drug reactions, drug interaction, contraindication of vasodilators
5. Clinical uses of vasodilators (hydralazine, minoxidil, sodium nitroprusside, organic nitrates, renin inhibitors, angiotensin-converting enzyme inhibitors, angiotensin receptor antagonists, calcium channel blockers, α_1 -blockers, endothelin receptor antagonists, neprilysin inhibitors)
6. Selection of vasodilators for treatment of hypertension

Learning Organization:

1. Studying materials provided in advance.
2. Lecture 50 minutes.
3. Question and answers 10 minutes.

Learning Materials:

PowerPoint lecture presentation

References:

1. Westfall TC, Westfall DP. Adrenergic agonists and antagonists. In: Brunton LL, editor. Goodman and Gilman's: The Pharmacological Basis of Therapeutics. 12th Ed. New York: McGraw-Hill; 2011. p. 277-334.
2. Hilal-Dandan R. Renin and angiotensin. In: Brunton LL, editor. Goodman and Gilman's: The Pharmacological Basis of Therapeutics. 12th Ed. New York: McGraw-Hill; 2011. p. 721-744.
3. Chong DY, Michel T. Pharmacology of vascular tone. In: Golan DE, editor. Principle of Pharmacology: The Pathophysiologic Basis of Drug Therapy. 3rd Ed. Philadelphia: Lippincott Williams & Wilkins; 2012. p. 353-371.
4. Katzung BG, Chatterjee K. Vasodilators & the treatment of angina pectoris. In: Katzung BG, Masters SB, Trevor AJ, editors. Basic & Clinical Pharmacology, 12th Ed. New York: McGraw-Hill ; 2012, p 193-210.
5. Rang HP, Ritter JM, Flower RJ, Henderson G. The vascular system. RANG and DALE's Pharmacology. 8th Ed. Philadelphia: Churchill Livingstone; 2016. p. 265-284.
6. Vardeny O, Miller R, and Solomon SD. Combined Nephilysin and renin-angiotensin system inhibition for the treatment of heart failure. JACC: Heart Failure. 2014;2:663-70.

Student Assessment:

MCQ exam

L5: Pharmacology of volume regulation

Lecturer: Somchai Yanrojana, Pharmacology, Faculty of Science

Learning Objectives: Students should be able to

1. Explain the function of kidney and urine formation process
2. Distinguish classification of diuretics
3. Know mechanism of action, pharmacological effects, pharmacokinetics, adverse drug reactions, precaution & warning, drug interaction, contraindication of diuretics
4. Describe the clinical uses of diuretics

Content Outlines:

1. Classification of diuretic agents based on chemistry, site, and mechanism of action.
2. Effect of diuretics on renal physiology
3. Pharmacological effects, pharmacokinetics, adverse drug reactions, precaution & warning, drug interaction, contraindication of diuretics
4. Use of diuretics in clinical practice

Learning Organization:

1. Studying materials in advance
2. 50-minute lecture
3. Question-and-answer session for 10 minutes

Learning Material Provided:

PowerPoint lecture presentation

References:

1. Reilly RF, Jackson EK. Regulation of renal function and vascular tone. In: Brunton LL, editor. Goodman and Gilman's: The Pharmacological Basis of Therapeutics. 12th Ed. New York: McGraw-Hill; 2011. p. 671-720.

2. Bhattacharya M, Alper SL. Pharmacology of volume regulation. In: Golan DE, editor. Principle of Pharmacology: The Pathophysiologic Basis of Drug Therapy. 3rd Ed. Philadelphia: Lippincott Williams & Wilkins; 2012. p. 332-352.
3. Katzung BG, Chatterjee K. Vasodilators & the treatment of angina pectoris. In: Katzung BG, Masters SB, Trevor AJ, editors. Basic & Clinical Pharmacology, 12th Ed. New York: McGraw-Hill ; 2012, p 193-210.
4. Rang HP, Ritter JM, Flower RJ, Henderson G. The kidney and urinary system. RANG and DALE's Pharmacology. 8th Ed. Philadelphia: Churchill Livingstone; 2016. p. 355-366.
5. Ernst ME and Moser M. Use of diuretics in patients with hypertension. *N Engl J Med*. 2009;361:2153-64.

Student Assessment:

MCQ exam

L6: Pharmacology of cardiac contraction

Lecturer: Somchai Yanrojana, Pharmacology, Faculty of Science

Learning Objectives:

Students should be able to:

1. Explain the mechanism of contraction and relaxation of the heart
2. Explain cellular pathophysiology of contractile dysfunction
3. Distinguish classification of inotropic drugs
4. Explain mechanisms of action, pharmacologic effects, pharmacokinetics, adverse drug reaction (ADR), drug interaction, contraindication and indication of inotropic drugs
5. Discuss the uses of inotropic drugs for treatment of contractile dysfunction

Content Outline:

1. Physiology of the heart and mechanism of contraction/relaxation of the heart
2. Pathophysiology of contractile dysfunction
3. Classification of inotropic drugs
 - 3.1 Digitalis: digoxin, digitoxin
 - 3.2 Other positive inotropic drugs: catecholamine beta adrenoceptor agonists, phosphodiesterase inhibitors, calcium-sensitizing agents
4. Pharmacological effects, pharmacokinetics, adverse drug reactions, precaution & warning, drug interaction, contraindication of inotropic drugs
5. Use of inotropic drugs in clinical practice

Learning Organization:

1. Studying materials provided in advance.
2. Lecture 50 minutes.
3. Question and answers 10 minutes.

Learning Materials:

PowerPoint lecture presentation

References:

1. Maron BA, Rocco TP. Pharmacotherapy of congestive heart failure. In: Brunton LL, editor. Goodman and Gilman's: The Pharmacological Basis of Therapeutics. 12th Ed. New York: McGraw-Hill; 2011. p. 789-814.
2. Chong DY, Michel T. Pharmacology of cardiac contractility. In: Golan DE, editor. Principle of Pharmacology: The Pathophysiologic Basis of Drug Therapy. 3rd Ed. Philadelphia: Lippincott Williams & Wilkins; 2012. p. 422-436.

3. Katzung BG. Drugs used in heart failure. In: Katzung BG, Masters SB, Trevor AJ, editors. Basic & Clinical Pharmacology, 12th Ed. New York: McGraw-Hill ; 2012, p 211-226.
4. Rang HP, Ritter JM, Flower RJ, Henderson G. The heart. RANG and DALE's Pharmacology. 8th Ed. Philadelphia: Churchill Livingstone; 2016. p. 247-264.
5. Hasenfuss G, Teerlink J. Cardiac inotropes: current agents and future directions. *Eur Heart J*. 2011;32:1838-45

Student Assessment:

MCQ exam

L7: Pharmacology of hematopoiesis

Lecturer: Noppawan Phumala Morales, Pharmacology, Faculty of Science

Learning Objectives:

Students are able to

1. Describe the etiology of anemia
2. Explain the mechanism, pharmacokinetics, clinical use and toxicities of agents used in anemia.
3. Discuss the uses of hematopoietic growth factors
4. Discuss the uses of iron chelators in hemochromatosis

Content Outline:

1. Classification and etiology of anemia
2. Agents used in anemia
 - 2.1 Iron
 - 2.2 Vitamin B12
 - 2.3 Folic acid
3. Hematopoietic growth factors
 - 3.1 Erythropoietin
 - 3.2 Myeloid growth factor
 - 3.3 Megakaryocyte growth factor
4. Iron chelators

Learning Organization:

1. Study the learning material provided in advance
2. Lecture 45 minutes
3. Question and answer 10 minutes

Learning Material Provided

1. Transcripts of the lecture outline
2. Slides from PowerPoint presentation

References:

1. Zehnder JL. Agents used in cytopenias; Hematopoietic growth factors. In: Katzung BG, Trevor AJ. eds. Basic and Clinical Pharmacology, 13e New York, NY: McGraw-Hill; 2015.

L8: Pharmacology of lipid metabolism

Lecturer: Noppawan Phumala Morales, Pharmacology, Faculty of Science

Learning Objectives:

Students should be able to:

1. Describe pathways of lipoprotein metabolism.
2. Explain the pathogenesis of atherosclerosis and the consequences.
3. Discuss mechanisms, clinical uses, and adverse effects of drugs used to treat dyslipidemia.

Content Outline:

1. Classification and functions of lipoproteins
2. Lipoprotein metabolism
3. Pathophysiology and classification of dyslipidemia
4. Etiology and consequences of atherosclerosis
5. Pharmacological treatment of dyslipidemia
 - a. Inhibitors of cholesterol synthesis
 - b. Inhibitors of bile acid absorption
 - c. Inhibitors of cholesterol absorption
 - d. Fibrates
 - e. Niacin
 - f. Omega-3 fatty acids

Learning Organization:

1. Studying materials provided in advance.
2. Lecture 50 minutes.
3. Question and answers 10 minutes.

Learning Materials:

PowerPoint lecture presentation

References:

1. Malloy MJ, Kane JP. Agents used in dyslipidemia. In: B G. Katzung, S B. Masters, A J. Trevor, editors. Basic & Clinical Pharmacology, 12th Ed.: New York: McGraw-Hill; 2012, p 619-34.
2. Cohen DE, Armstrong EJ. Pharmacology of cholesterol and lipoprotein metabolism. In: D E. Golan, A H Tashjian Jr, E J Armstrong, A W Armstrong, editors. Principles of pharmacology: the pathophysiologic basis of drug therapy. 3rd ed. Baltimore: Lippincott Williams & Wilkins; 2012. p. 311-31.

L9-10: Drugs used in the treatment of GI diseases

Lecturer: Somchai Yanrojana, M.D., Ph.D., Pharmacology, Faculty of Science

Learning Objectives: Students should be able to

1. Describe mechanism of action of drugs for peptic ulcer disease and gastroesophageal reflux
2. Discuss the major adverse effects and limitation of current treatment for peptic ulcer disease and gastroesophageal reflux
3. Explain the mechanism of action of anti-emetic and prokinetic drugs
4. Discuss the difference between anti-emetic and prokinetic drugs
5. Select the proper anti-emetic drugs to alleviate chemotherapy induced vomiting, post-operative vomiting, motion sickness and hyperemesis of pregnancy
6. Compare adverse effects of anti-emetic and prokinetic drugs
7. Explain the mechanism of action of anti-diarrheal drugs and laxatives
8. List adverse effects of anti-diarrheal drugs and laxatives

Content Outline:

1. Regulation of gastric acid secretion
2. Acid-reducing drugs
 - Antacid
 - H₂ antagonist
 - Proton pump inhibitor
3. Protection of gastric mucosa
 - Sucralfate
 - Misoprostol

4. Eradication of *Helicobacter pylori*
5. Prokinetic drugs
 - D2 antagonist
 - 5-HT4 agonist
6. Pathophysiology of nausea and vomiting
 - Neurotransmitters
 - Pathways
7. Antiemetic drugs
 - D2 antagonist
 - 5-HT3 antagonist
 - NK1 antagonist
 - Cannabinoid agonist
8. Laxatives
 - Bulk forming laxatives
 - Surfactant laxatives
 - Osmotic laxatives
 - Non-specific stimulant laxatives
9. Anti-diarrheal drugs
 - Oral rehydration solution
 - Adsorbents
 - Opioid agonist

Learning Organization:

1. Studying the learning materials provided in advance
2. Lecture part 1 – 50 min
3. Break 10 min
4. Lecture part 2 – 50 min
5. Questions and answers 10 min

Learning Materials Provided:

1. Slides from PowerPoint lecture presentation

References:

1. Brunton LL, Knollmann BC. Goodman & Gilman's The Pharmacological Basis of Therapeutics, 14th ed. McGraw-Hill Education. 2022
2. Vanderah TW. Katzung's Basic & Clinical Pharmacology, 16th Edition. McGraw-Hill; 2024

Student Assessment: MCQ

L11: Introduction to CNS pharmacology

Lecturer: Nattinee Jantaratnotai, Pharmacology, Faculty of Science

Date/Time: 18 September 2025, 11.00-12.00

Learning Objectives:

Students should be able to

1. Describe chemicals used in neurotransmission
2. Explain the concept of synaptic transmission
3. Explain the key step in the synthesis, storage, release and inactivation of the major neurotransmitters: glutamate, GABA, acetylcholine, dopamine, norepinephrine, serotonin
4. List neurotransmitter receptors and ion channels
5. Identify sites of CNS drug action

Content Outline:

1. Sites of CNS drug action

2. Neurotransmission process of the major neurotransmitters: glutamate, GABA, acetylcholine, dopamine, norepinephrine, serotonin

2.1 Function

2.2 Synthesis

2.3 Receptor

2.4 Degradation

Learning Organization:

1. Studying the learning materials provided in advance
2. Lecture 50 min
3. Questions and answers 10 min

Learning Materials Provided:

1. Slides from PowerPoint lecture presentation

References:

3. Brunton LL, Knollmann BC. Goodman & Gilman's The Pharmacological Basis of Therapeutics, 14th ed. McGraw-Hill Education. 2022
4. Vanderah TW. Katzung's Basic & Clinical Pharmacology, 16th Edition. McGraw-Hill; 2024

Student Assessment:

MCQ

L12-13: Drugs for respiratory disorders

Lecturer: Pimtip Sanvarinda, Pharmacology, Faculty of Science

Learning Objectives: students should be able to

1. Describe the principle and mechanism of action of drugs used in respiratory system
2. Give examples of drugs combination in treatment of asthma and COPD
3. Describe the side effects of drugs used in respiratory system

Content Outlines:

- antitussive
- mucoactive agents (expectorant, mucolytics)
- drugs used in asthma and COPD
 - bronchodilators
 - leukotriene antagonists
 - mast cell stabilizers
 - corticosteroids
 - anti-IgE antibody

Learning Organization: Lectures

References:

1. Tripathi, KD. Essentials of Medical Pharmacology. 7th ed. New Delhi: Jaypee Brothers, 2013.
2. Basic and Clinical Pharmacology, 15th ed (2020) Editor: Katzung B & Trevor A. McGraw-Hill Education.

L14: Drugs for movement disorders

Lecturer: Pimtip Sanvarinda, Pharmacology, Faculty of Science

Objectives: students should be able to

1. Describe the pathophysiology of Parkinson's disease and other movement disorders
2. Give examples of drugs used in treatment of Parkinson's disease and other movement disorders
3. Describe the side effects of drugs used for movement disorders

Class outline:

1. The dopaminergic pathway
2. Pathophysiology of parkinsonism
 - Parkinson's disease
3. Drug-induced parkinsonism
4. Drugs for treatment of Parkinson's disease
 - levodopa
 - dopamine receptor agonists
 - Catechol-O-Methyltransferase (COMT) inhibitors
 - selective MAO-B inhibitors
 - muscarinic receptor antagonists
 - Miscellaneous: treatments for tremor, tics, Huntington's chorea

Examination: MCQ

Reference:

1. Brunton LL, Knollmann BC. Goodman & Gilman's The Pharmacological Basis of Therapeutics, 14th ed. McGraw-Hill Education. 2022
2. Vanderah TW. Katzung's Basic & Clinical Pharmacology, 16th Edition. McGraw-Hill; 2024

L15: Local anesthetics

Lecturer: Ruedee Hemstapat, Department of Pharmacology, Faculty of Science

Learning objectives:

Students are able to

1. Describe how a local anesthetic works (mechanism of action)
2. Explain how local anesthetics block the response to pain.
3. Explain the difference between the two classes of local anesthetic
4. Describe the adverse effects and precautions associated with the use of local anesthetics

Content outline:

- Mechanism of action of local anesthetics
- Pharmacological effects of local anesthetics
- Classification of local anesthetics
- Adverse effects and precautions associated with the use of local anesthetics

Learning organization:

- 50-min lecture
- 10-min discussion (question and answer)

References

1. Katzung, B.C. (2015) Basis and Clinical Pharmacology, 13rd ed. Lange Medical Books. The McGraw-Hill Companies, Inc.
2. Rang HP, Dale MM, Ritter JM and Moore PK. (2023). Rang & Dale's Pharmacology, 10 th ed. Elsevier.
3. Brenner GM and Stevens CW. Pharmacology (student consult), 4th ed. 2013.
4. Hitner H and Nagle B. Pharmacology: an introduction, 6th ed. 2012

L16: General anesthetics

Lecturer: Ruedee Hemstapat, Department of Pharmacology, Faculty of Science

Learning objectives:

Students are able to

1. Explain stages of anesthesia
2. Describe types of general anesthesia
3. Explain the mechanism of action, pharmacokinetics of anesthetics
4. Discuss the pharmacological effects of general anesthetics

Content outline:

- Mechanism of action of general anesthetics
- Types of general anesthesia: Intravenous anesthetics and Inhalation anesthetics
- Pharmacokinetic and pharmacological effects of general anesthetics
- Adverse effects and precautions associated with the use of general anesthetics

Learning organization:

- 50-min lecture
- 10-min discussion (question and answer)

References

1. Katzung, B.C. (2015) Basis and Clinical Pharmacology, 13rd ed. Lange Medical Books. The McGraw-Hill Companies, Inc.
2. Rang HP, Dale MM, Ritter JM and Moore PK. (2023). Rang & Dale's Pharmacology, 10 th ed. Elsevier.
3. Brenner GM and Stevens CW. Pharmacology (student consult), 4th ed. 2013.
4. Hitner H and Nagle B. Pharmacology: an introduction, 6th ed. 2012

L17: Antidepressants

Lecturer: Nattinee Jantaratnotai, Pharmacology, Faculty of Science

Learning Objectives:

Students should be able to

1. Define and classify mood disorders
2. Discuss pathogenesis of depression
3. Classify antidepressants according to mechanism of action
4. Discuss the pharmacological properties, mechanism of action and adverse effects of various antidepressants
5. List the major side effects of antidepressants
6. List the uses of antidepressants

Content Outline:

1. Classification and symptoms of mood disorders
2. The pathogenesis of depression
3. Classification of antidepressants
4. Pharmacological properties, mechanism of action and adverse effects of antidepressants
5. Clinical uses of antidepressants

Learning Organization:

1. Studying the learning materials provided in advance
2. Lecture 100 min
3. Questions and answers 10 min

Learning Materials Provided:

1. Slides from PowerPoint lecture presentation

References:

5. Brunton LL, Knollmann BC. Goodman & Gilman's The Pharmacological Basis of Therapeutics, 14th ed. McGraw-Hill Education. 2022
6. Vanderah TW. Katzung's Basic & Clinical Pharmacology, 16th Edition. McGraw-Hill; 2024

L18: Antipsychotic drugs

Lecturer: Nattinee Jantaratnotai, Pharmacology, Faculty of Science

Learning Objectives:

Students are be able to

1. Describe dopamine pathways
2. Compare typical and atypical antipsychotics
3. List 2-3 drugs in each group
4. Describe therapeutic uses of antipsychotic drugs
5. List the major side effects of antipsychotic drugs

Content Outline:

1. Major symptoms of schizophrenia: positive vs negative symptoms
2. Classification of antipsychotic drugs
 - 2.1 Typical antipsychotic drugs
 - 2.2 Atypical antipsychotic drugs
3. Pharmacological properties, mechanisms of action and major side effects of antipsychotic drugs

Learning Organization:

1. Studying the learning materials provided in advance
2. Lecture 50 min

References:

1. Brunton LL, Knollmann BC. Goodman & Gilman's The Pharmacological Basis of Therapeutics, 14th ed. McGraw-Hill Education. 2022
2. Vanderah TW. Katzung's Basic & Clinical Pharmacology, 16th Edition. McGraw-Hill; 2024

L19: Antiepileptic drugs

Lecturer: Nattinee Jantaratnotai, Pharmacology, Faculty of Science

Learning Objectives:

Students should be able to

1. Describe the mechanisms of seizures
2. Explain the pharmacological properties and mechanisms of action of antiepileptic drugs
3. Compare major side effects and limitation of antiepileptic drugs
4. Identify potential targets and/or preferable characteristic for novel antiepileptic drugs

Content Outline:

1. Pathophysiology of epilepsy
2. Drugs that decrease excitation
 - 2.1 Sodium channel blockers: Phenytoin, carbamazepine, valproate, lamotrigine, topiramate
 - 2.2 Calcium channel blockers: Ethosuximide, valproate
 - 2.3 Potassium channel openers: Retigabine
 - 2.4 Glutamate receptor antagonists: Felbamate, topiramate, perampanel
 - 2.5 Glutamate release inhibitors: Gabapentin
3. Drugs that increase inhibition
 - 3.1 GABA-A agonists: Benzodiazepines
 - 3.2 GABA uptake inhibitor: Tiagabine
 - 3.3 GABA transaminase inhibitor: Vigabatrin, valproate
4. Miscellaneous mechanism: Levetiracetam

Learning Organization:

1. Studying the learning materials provided in advance
2. Lecture 50 min
3. Questions and answers 10 min

Learning Materials Provided:

1. Slides from PowerPoint lecture presentation

References:

1. Brunton LL, Knollmann BC. Goodman & Gilman's The Pharmacological Basis of Therapeutics, 14th ed. McGraw-Hill Education. 2022
2. Vanderah TW. Katzung's Basic & Clinical Pharmacology, 16th Edition. McGraw-Hill; 2024
3. Hill DS, Wlodarczyk BJ, Palacios AM, Finnell RH. Teratogenic effects of antiepileptic drugs. *Expert Rev Neurother*. 2010;10(6):943-59.
4. Hernández-Díaz S, Smith CR, Shen A, Mittendorf R, Hauser WA, Yerby M, Holmes LB; North American AED Pregnancy Registry; North American AED Pregnancy Registry. Comparative safety of antiepileptic drugs during pregnancy. *Neurology*. 2012;78(21):1692-9.

Student Assessment:

MCQ

L20: Anxiolytic drugs

Lecturer: Nattinee Jantaratnotai, Pharmacology, Faculty of Science

Learning Objectives:

Students should be able to

1. Describe and classify anxiety disorders
2. Describe the role of neurotransmitters in the development of anxiety disorders
3. Consider the benefits and risks of types of medication used to treat anxiety disorders

Content Outline:

1. Classification of anxiety disorders
2. The role of neurotransmitters in the development of anxiety disorders
3. Mechanism of action, pharmacological effects and side effects of anxiolytic drugs

Learning Organization:

1. Studying the learning materials provided in advance
2. Lecture 50 min
3. Questions and answers 10 min

Learning Materials Provided:

1. Slides from PowerPoint lecture presentation

References:

7. Brunton LL, Knollmann BC. Goodman & Gilman's The Pharmacological Basis of Therapeutics, 14th ed. McGraw-Hill Education. 2022
8. Vanderah TW. Katzung's Basic & Clinical Pharmacology, 16th Edition. McGraw-Hill; 2024

L21: Drugs for dementia

Lecturer: Nattinee Jantaratnotai, Pharmacology, Faculty of Science

Learning Objectives:

Students are able to

1. Define the following terms: declarative memory, non-declarative memory, amnesia, dementia
2. Describe the possible mechanisms that lead to neuronal cell death
3. Describe risk factors and causes of dementia
4. Describe symptoms of Alzheimer's disease
5. Discuss pathophysiology of Alzheimer's disease
6. Describe the current therapeutic approaches for the treatment and prevention of Alzheimer's disease

Content Outline:

1. Definition and classification of learning and memory
2. Possible mechanisms that lead to neuronal cell death

3. Risk factors and causes of dementia
4. Symptoms of Alzheimer's disease
5. Pathophysiology of Alzheimer's disease
6. Current therapeutic approaches for the treatment and prevention of Alzheimer's disease

Learning Organization:

1. Studying the learning materials provided in advance
2. Lecture 50 min
3. Questions and answers 10 min

References:

1. Vanderah TW. Katzung's Basic & Clinical Pharmacology, 16th Edition. McGraw-Hill; 2024
2. Rang HP, Dale MM, Ritter JM and Moore PK. (2023). Rang & Dale's Pharmacology, 10 th ed. Elsevier.

L22: NSAIDs

Lecturer: Ruedee Hemstapat, Department of Pharmacology, Faculty of Science

Learning Objectives: After completion of this lecture, the students should be able to:

1. Describe the classification of analgesics and NSAIDs
2. Discuss the differences between selective and non-selective COX-2 inhibitors
3. Describe the mechanism of actions for NSAIDs
4. Describe the general therapeutic uses of NSAIDs
5. Describe the common adverse effects of NSAIDs
6. Describe the mechanisms of action, therapeutic uses, and common adverse effects of NSAIDs and drugs used in gout

Content Outline:

1. Overview of analgesics and NSAIDs
2. Overview of arachidonic acid pathway
3. Selective and non-selective COX-2 inhibitors
4. Mechanisms of actions, therapeutic uses and common adverse effects of NSAIDs
5. Drugs used in gout

Learning Organization:

1. Lecture 50 min
2. Questions and answers 10 min

Learning Materials Provided:

1. Slides from PowerPoint lecture presentation

References:

9. Brunton LL, Knollmann BC. Goodman & Gilman's The Pharmacological Basis of Therapeutics, 14th ed. McGraw-Hill Education. 2022
10. Vanderah TW. Katzung's Basic & Clinical Pharmacology, 16th Edition. McGraw-Hill; 2024

Student Assessment: MCQ

L23: Opioids

Lecturer: Ruedee Hemstapat, Pharmacology, Faculty of Science

Learning objectives:

Students are able to

5. Explain the mechanisms of action and how opioids produce analgesia.
6. Describe the pharmacological effects of opioid drugs.

7. Describe the adverse effects and precautions associated with the use of opioid drugs

Content outline:

- Pain pathways
- Mechanism of action of opioids
- Pharmacological effects of opioids
- Opioid agonists and opioid antagonists
- Adverse effects and precautions associated with the use of opioid drugs

Learning organization:

- 50-min lecture
- 10-min discussion (question and answer)

References

5. Katzung, B.C. (2015) Basis and Clinical Pharmacology, 13rd ed. Lange Medical Books. The McGraw-Hill Companies, Inc.
6. Rang HP, Dale MM, Ritter JM and Moore PK. (2023). Rang & Dale's Pharmacology, 10 th ed. Elsevier.
7. Brenner GM and Stevens CW. Pharmacology (student consult), 4th ed. 2013.
8. Hitner H and Nagle B. Pharmacology: an introduction, 6th ed. 2012

Student Assessment:

MCQ