

Learning unit: Sympathotropic agents

Important terms

sympathotropic substances

direct sympathomimetic agents

non-selective sympathomimetics

indications

adverse effects

contraindications

drugs

adrenaline (epinephrine)

noradrenaline (norepinephrine)

dopamine

isoprenaline

selective sympathomimetics

alpha1 selective sympathomimetics (adrenergic agonists)

indications

adverse effects

contraindications

drugs

phenylephrine

naphazoline

xylometazoline

alpha2 selective sympathomimetics

indications

adverse effects

contraindications

drugs

methyldopa

clonidine

dexmedetomidine

beta1 selective sympathomimetics

indications

adverse effects

contraindications

drugs

dobutamine

beta2 selective sympathomimetics

indications

adverse effects

contraindications

drugs

hexoprenaline

terbutaline

salbutamol

- fenoterol
- salmeterol
- clenbuterol
- SABA, LABA, U-LABA, RABA
- beta3 selective sympathomimetics
- mirabegron
- indirect sympathomimetic agents
 - pseudoephedrine/ephedrine
 - methylxanthines
 - amphetamine psychostimulants
- direct sympatholytic agents
 - alpha-lytics (alpha-adrenoreceptor antagonists)
 - alpha1 sympatholytics
 - indications
 - adverse effects
 - contraindications
 - drugs
 - doxazosin
 - tamsulosin
 - urapidil
 - non-selective alpha-lytics
 - ergot alkaloids
 - beta-lytics (beta-adrenoreceptor antagonists)
 - indications
 - adverse effects
 - contraindications
 - drugs
 - cardio-selective beta1 blocker
 - metoprolol
 - atenolol
 - bisoprolol
 - esmolol
 - betaxolol
 - cardio-selective beta1 blocker with ISA (partial agonist)
 - acebutolol
 - celiprolol
 - non-selective beta blocker without ISA
 - propranolol
 - sotalol
 - timolol
 - non-selective beta blocker with ISA
 - carvedilol
 - sympatholytics with combined effects
(non-selective beta blockers, selective alpha1 blockers)
 - labetalol
 - carvedilol

Learning outcomes

Student describes characteristics of sympathotropic drugs, their mechanisms of action, typical side effects, basic pharmacokinetic properties and their basic indications and contraindications.

Student distinguishes between direct and indirect mechanisms of action of sympathotropic substances and gives examples of concrete drugs.

Student distinguishes agents with sympathomimetic and sympatholytic effects.

Student distinguishes individual beta-blockers based on their potency (affinity) and efficacy (intrinsic activity).

Student gives examples of beta-lytics, which are competitive antagonists, partial agonists with intrinsic sympathomimetic activity (ISA) and representatives with combined alpha and beta effects.

Student knows basic pharmacological profile (mode of action, unwanted effects, indications and contraindications) of single subgroups of sympathotropic drugs.

Study materials

Rang & Dale's Pharmacology, 9th edition, 2020, chapter 12-14; chapter 40
Study materials for courses aVLFA0721p and aVLFA0721c.

Exam questions

Special pharmacology: 1. Sympathomimetics - overview of single classes and their indications, examples of drugs, 2. Sympatholytics - overview of single classes and their indications, examples of drugs

Essential drugs: 24. dobutamine, 25. doxazosin, 73. methyldopa, 75. metoprolol, 83. noradrenaline, 86. oxymetazoline, 98. salbutamol

Learning unit: Cholinotropic agents

Important terms

cholinotropic agents

direct cholinotropics

nicotinic receptor agonists

nicotine

depolarizing muscle relaxants

suxamethonium

see Learning unit 10.3 Muscle relaxants

muscarinic receptor agonists – parasympathomimetics

indications

contraindications

adverse effects

representatives

pilocarpine

carbachol

cevimeline

indirect cholinomimetics

acetylcholinesterase inhibitors

indications

contraindications

adverse effects

representatives

reversible AChE inhibitors

tertiary ammonium bases

physostigmine

rivastigmine

donepezil

galantamine

quaternary ammonium bases

neostigmine

pyridostigmine

distigmine

ambenonium

edrophonium

irreversible AChE inhibitors

organophosphates

insecticides, pesticides

contact nerve poisons

principles of the organophosphate intoxication therapy
(obidoxime)

direct cholinolytics

parasympatholytics (muscarinic receptors antagonists)

agents with tertiary nitrogen (cross BBB)

indications

contraindications

- adverse effects
- representatives
 - atropine
 - hyoscine (scopolamine)
 - biperiden
 - procyclidine
- agents with quaternary ammonium
 - indications
 - contraindications
 - adverse effects
 - representatives
 - butylhyoscine (butylscopolamine)
 - otilonium
 - fenpiverine
 - bronchial antispasmodics (SAMA, LAMA)
 - ipratropium**
 - tiotropium**
 - umeclidinium**
 - aclidinium**
 - urinary spasmolytics (selective M3 antagonists)
 - solifenacin**
 - darifenacin**
- blockade of nicotinic receptor
 - ganglionic blockers (neural nicotinic (N_N) receptors)
 - non-depolarizing peripheral muscle relaxants (blockers of the muscular nicotinic (N_M) receptors) (see Learning unit Muscle relaxants 10.3.)
- indirect cholinolytics
 - botulinum toxin

Learning outcomes

- Student knows basic pharmacological profile (mode of action, unwanted effects, indications and contraindications) of cholinotropic substances.
- Student defines the cholinomimetic and the parasympathomimetic agent.
- Student distinguishes between cholinomimetic and cholinolytic agents.
- Student describes symptoms of poisoning/overdosing with organophosphates and suggests pharmacotherapy.
- Student gives examples of topical use of cholinotropic substances (e.g. mydriatics/miotics, antiglaucoma agents in ophthalmology).

Study materials

Rang & Dale's Pharmacology, 9th edition, 2020 – Chapter 13 (Chemical Modulators of autonomic nervous system) + 14 (Cholinergic transmission)

Study materials for courses aVLFA0721p and aVLFA0721c.

Exam questions

Special pharmacology: 3. Cholinomimetics, 4. Cholinolytics 5. Spasmolytics of the GIT and UGT
Essential drugs: 10. atropine, 50. ipratropium, 92. Pilocarpine, 97. rivastigmine, 100. Solifenacin,
103. suxamethonium

Learning unit: Antispasmodics of the GIT and UGT

Important terms

antispasmodic agents (spasmolytic agents)

direct cholinolytics

muscarinic receptor blockers

(antimuscarinics - neurotropic antispasmodics = parasympatholytics)

tertiary amines (blood-brain barrier penetration)

atropine

agents with quaternary ammonium structure

butylscopolamine (hyoscine butylbromide)

otilonium

fenpiverinium

urinary antispasmodic agents

antimuscarinics

solifenacin (selective M3 antagonist)

darifenacin (selective M3 antagonist)

trospium (M1 and M3 antagonist)

tolterodine (non-selective antimuscarinic)

fesoterodine (prodrug)

adrenergic agents

beta 3 agonist

mirabegron

musculotropic antispasmodic agents

papaverine

drotaverine

mebeverine

alverine

pitofenone

antispasmodics with combined mode of action (neurotropic and/or musculotropic)

oxybutinine

propiverine

other antispasmodics

antiflatulent (carminative) agents

Learning outcomes

Student distinguishes antispasmodic agents according to their mechanism of action.

Student knows basic pharmacological profile (mode of action, unwanted effects, indications and contraindications) of parasympatholytics and muscolotropic antispasmodics.

Student gives examples of spasmolytic agents according to their indications.

Student describes symptoms of poisoning/overdose with parasympatholytics and proposes pharmacotherapy.

Student gives examples of common spasmolytic combinations.

Study materials

Rang & Dale's Pharmacology, 9th edition, 2020 – Chapter 14
Section Antimuscarinic Agents, chapter 29 (Respiratory system), chapter 30 (The kidney and urinary system), chapter 31 (The gastrointestinal tract), Section Antimotility and Spasmolytic Agents, chapter 40 (Other transmitters and modulators)

Study materials for courses aVLFA0721p and aVLFA0721c.

Exam questions

Special pharmacology: 5. Antispasmodics - GIT + GUT

Essential drugs: 35. fempiverinine/pitofenone, 100. solifenacin

Learning unit: Muscle relaxants

Important terms

skeletal muscle relaxants

central muscle relaxants

baclofen

tizanidine

guaifenesin (glyceryl guaiacolate)

tolperisone

mephenoxalone

diazepam

thiocolchicoside

orphenadrine

Cannabis sativa extract with defined content of THC and CBD

peripheral muscle relaxants

with indirect mechanism

botulinum toxin

with direct mechanism

depolarizing peripheral muscle relaxants

suxamethonium

non-depolarizing peripheral muscle relaxants

pipecuronium

atracurium

rocuronium

mivacurium

dantrolene

agents used for decurarization

acetylcholinesterase inhibitors

sugammadex

therapy of malignant hyperthermia

dantrolene

Learning outcomes

Student knows basic pharmacological profile (mode of action, unwanted effects, indications and contraindications) of muscle relaxants.

Student distinguishes the peripheral and the central muscle relaxants and gives examples.

Student knows drugs used for the termination of muscle relaxation after general anaesthesia.

Study materials

Rang & Dale's Pharmacology, 9th edition, 2020 , Chapter 14, Chapter 42, Chapter 46

Study materials for courses aVLFA0721p and aVLFA0721c.

Exam questions

Special pharmacology: 11 Muscle relaxants

Essential drugs: 22. Diazepam, 103. suxamethonium

Learning unit: General anaesthetics

Important terms

general anaesthetics

inhalational anaesthetics

MAC (minimum alveolar concentration)

volatile anaesthetic liquids

ethers (diethylether)

halogenated hydrocarbons

isoflurane

sevoflurane

desflurane

anaesthetic gases

nitrous oxide

xenon

intravenous anaesthetics

MIR (minimum infusion rate)

barbiturates

thiopental

nonbarbiturate anaesthetics

ketamine

propofol

etomidate

opioids used in anaesthesiology

fentanyl

alfentanil

sufentanil

remifentanil

benzodiazepines used in anaesthesiology

diazepam

midazolam

balanced general anaesthesia

combined general anaesthesia

course of anaesthesia

premedication

prokinetics/antiemetics

hypnotics/anxiolytics

atropine

induction of general anaesthesia (GA)

maintenance of GA

termination of GA

acetylcholinesterase inhibitors, sugammadex

naloxone

flumazenil

risks and complications of GA

malignant hyperthermia

dantrolene

Learning outcomes

Student knows basic pharmacological profile (mode of action, unwanted effects, indications and contraindications) of general anaesthetic agents.

Student defines individual stages of general anaesthesia.

Student explains classification of general anaesthetics according to route of administration (inhalational, intravenous).

Student knows drug groups used in the premedication before general anaesthesia and gives examples of agents.

Student selects appropriate premedication for a model patient based on the symptomatology.

Study materials

Rang & Dale's Pharmacology, 9th edition, 2020, chapter General anaesthetic agents

Study materials for courses aVLFA0721p and aVLFA0721c.

Exam questions

Special pharmacology: 9. General anaesthetics

Essential drugs: desflurane, propofol, ketamine

Learning unit: Local anaesthetics

Important terms

local anaesthetics (LA)

mechanism of action

pharmacokinetics

factors influencing LA effects

pH

nerve fibre properties (thickness, myelination)

adverse effects of LA

cardiovascular

neurotoxicity

allergy, methemoglobinemia

ester local anaesthetics

cocaine

procaine

tetracaine

benzocaine

oxybuprocaine

amide local anaesthetics

trimecaine

lidocaine

articaine

mepivacaine

bupivacaine

levobupivacaine

ropivacaine

prilocaine

cinchocaine

vasoconstrictor agents used in LA

techniques of local anaesthesia

topical (surface) anaesthesia

EMLA

infiltration anaesthesia

conduction peripheral

conduction central

subarachnoid (spinal) anaesthesia

epidural anaesthesia

Learning outcomes

Student knows basic pharmacological profile (mode of action, unwanted effects, indications and contraindications) of local anaesthetics.

Student knows different techniques of local anaesthesia and their characteristics.

Student summarizes basic differences between amide and ester local anaesthetic agents.

Student gives examples of vasoconstrictor agents used in combination with local anaesthetics.

Study materials

Rang & Dale's Pharmacology, 9th edition, 2020, chapter Local anaesthetics and other drugs affecting sodium channels

Study materials for courses aVLFA0721p and aVLFA0721c.

Exam questions

Special pharmacology: 10. Local anaesthetics

Essential drugs: lidocaine

Name of the teaching unit: Non-opioid analgesics, antimigraine drugs

Important terms

analgesics-antipyretics

paracetamol (syn. acetaminophen)

nonsteroidal anti-inflammatory drugs (NSAIDs)

non-selective COX inhibitors

salicylates

acetylsalicylic acid

acetic acid derivatives

indomethacin

diclofenac

propionic acid derivatives

ibuprofen

ketoprofen

naproxen

oxicams

meloxicam

pyrazolones

metamizole

propyphenazone

preferential cyclooxygenase-2 inhibitors (COX2-inhibitors)

nimesulid

meloxicam

selective cyclooxygenase-2 inhibitors

celecoxib

adverse effects of NSAIDs and antipyretics

salicylism

nephropathy

Reye's syndrome

gastrotoxicity

cardiotoxicity

hepatotoxicity

antimigraine drugs

acute attack

non-opioid analgesics

paracetamol

acetylsalicylic acid

ibuprofen

5-HT₁ receptor agonists

sumatriptan

combination with prokinetics

metoclopramide

attack prevention
metoprolol
tricyclic antidepressants
SSRIs
valproic acid
gabapentin
topiramate
verapamil

Learning outcomes

The student distinguishes between opioid and non-opioid analgesics and characterizes their properties.

The student distinguishes between analgesics-antipyretics and nonsteroidal anti-inflammatory drugs.

The student will give examples of representatives of analgesics-antipyretics and nonsteroidal anti-inflammatory drugs.

The student will present the primary indications of analgesics-antipyretics, their main side effects, and contraindications.

The student will present the primary indications for nonsteroidal anti-inflammatory drugs, their main side effects, and contraindications.

The student distinguishes individual nonsteroidal anti-inflammatory drugs due to their selectivity for COX.

Study materials

Rang & Dale's Pharmacology, 9th edition, 2020, chapter 27
Study materials for courses aVLFA0721p and aVLFA0721c.

Exam questions

Special pharmacology: 7. NSAIDs, non-opioid analgesics, antimigraine agents

Essential drugs: 44. ibuprofen, 47. indometacin, 60. acetylsalicylic acid, 71. metamizole, 81. nimesulide, 90. paracetamol, 102. sumatriptan

Name of the teaching unit: Antiuratics, antirheumatics

Impact of the learning unit

The knowledge of antiuratic agents and pharmacotherapy of the acute and chronic forms of gout is considered to be the basic knowledge of each student of medicine and requires the knowledge of biochemistry, physiology, pathological physiology.

Important terms

antiuratics for an acute gout attack

- colchicine (oral formulation only)
- nonsteroidal anti-inflammatory agents (NSAIDs) with uricosuric effects
 - ibuprofen
 - indomethacin
- corticosteroids (systemic or intra-articular) in case of contraindications to NSAIDs
 - prednisone
 - methylprednisolone
- biological therapy anti IL-1 β
 - canakinumab

antiuratics for chronic therapy of gout

- uricostatic agents (uric acid lowering therapy) - xanthine oxidase inhibitors
 - allopurinol
 - febuxostat
- uricase enzymes (conversion of the poorly soluble urate to allantoin excreted in the urine)
 - rasburicase
- uricosuric agents
 - lesinurad

antirheumatics

- NSAIDs
- glucocorticoids
 - prednisone
 - methylprednisolone
- DMARDs
 - conventional treatment
 - methotrexate
 - sulfasalazine
 - leflunomide
 - hydroxychloroquine
 - targeted treatment

Janus kinase inhibitors

- biological treatment
 - anti-TNF drugs
 - infliximab
 - adalimumab
 - etanercept
- anti-IL 1
 - anakinra
- anti-IL 6
 - tocilizumab
- drugs targeting T and B lymphocytes
 - natalizumab
 - rituximab

Learning outcomes

Student knows basic pharmacological profile (mode of action, unwanted effects, indications and contraindications) of antiuratic agents.

Student distinguishes pharmacotherapy of the acute gout attack and pharmacotherapy of chronic forms of gout.

Student defines the uricostatic and the uricosuric agent.

The student selects appropriate pharmacotherapy for a model patient based on the disease symptomatology.

Study materials

Rang & Dale's Pharmacology, 9th edition, 2020, chapter Anti-inflammatory and immunosuppressant drugs)

Study materials for courses aVLFA0721p and aVLFA0721c.

Exam questions

Special pharmacology: 8. Antiuratics, antirheumatics incl. DMARDs

Essential drugs: 27. allopurinol

Name of the teaching unit: Opioid analgesics

Important terms

Opioid analgesics

- **Indication**
- **Contraindication**
- **Adverse effects**
- **Most important drugs**
 - strong opioid analgesics
 - morphine
 - piritramide
 - **fentanyl**
 - **sufentanil**
 - **remifentanyl**
 - oxycodone
 - methadone
 - pethidine
 - moderate and weak opioid analgesics
 - codeine
 - dihydrocodeine
 - atypical opioids
 - tramadol
 - tapentadol
 - partial agonists and mixed agonist-antagonists
 - buprenorphine
 - nalbuphine
 - antagonists of opioid analgesics
 - naloxone
 - naltrexone

Learning outcomes

The student knows the types of opioid receptors, their location and function.

The student describes the peripheral and central effects of opioids.

Student knows basic pharmacological profile (mode of action, unwanted effects, indications and contraindications) of opioid analgesics.

Student describes basic principles of pharmacotherapy of the acute and chronic pain.

Student distinguishes opioid and non-opioid analgesics.

The student characterizes basic classes of opioids - agonists, antagonists, partial agonists, atypical opioids and gives examples.

Student gives examples of opioids used as analgesics, in anaesthesiology as part of analgosedation, opioids used as antitussives, antidiarrhoeal agents and opioids used in the substitution therapy of opioid addiction.

Student describes the management of the acute intoxication with opioids.

Study materials

Rang & Dale's Pharmacology, 9th edition, 2020, chapter 43
Study materials for courses aVLFA0721p and aVLFA0721c.

Exam questions

Special pharmacology: 6. Opioid analgesics

Essential drugs: 12. buprenorphine, 36. fentanyl, 58. codein, 79. morphine, 80. naloxone, 107. tramadol

Learning unit: Antidiabetics

Relevant terms

oral antidiabetics

- biguanides
 - metformin
 - lactic acidosis
- sulfonylureas
 - glibenclamide
 - gliclazide
 - weight gain, hypoglycemia
 - pharmacokinetic interactions
- thiazolidinediones
 - **pioglitazone**
- inhibitors of intestinal glucosidases
 - acarbose
- meglitinides
 - **repaglinide**
- SGLT2 inhibitors (gliflozines, glycosurics)
 - **empagliflozin**
- DPP-4 inhibitors (gliptins)
 - **linagliptin**

injectable antidiabetic agents except insulins

- GLP1 analogues (incretin mimetics)
 - exenatide

Learning outcomes

Student differs antidiabetic agents according to their route of administration and gives advantages and disadvantages of such administration.

Student explains mechanisms by which antidiabetics influence insulin secretion or insulin resistance. Student is aware of drug groups able to induce hypoglycemia and knows other adverse effects, including potential influence on body weight.

Student knows basic pharmacological profile (mode of action, unwanted effects, indications and contraindications) of antidiabetics.

Student describes an algorithm for choosing an antidiabetic agent for a model patient.

Study materials

Rang & Dale's Pharmacology, 9th edition, 2020 - kapitola 32 The control of blood glucose and drug treatment of diabetes mellitus

Study materials for courses aVLFA0721p and aVLFA0721c.

Exam questions

Special pharmacology: 12. Antidiabetics (except insulins)

Essential drugs: 72. metformin, 28. empagliflozin, 66. linagliptin

Learning unit: Insulins

Relevant terms

insulins

- classification according to their onset and duration of effect
 - short-acting insulins
 - rapid-acting analogues
 - lispro
 - aspart
 - glulisine
 - short-acting human insulins
 - neutral insulin solutions
 - intermediate-acting insulins
 - NPH insulin (Isophane insulin)
 - long-acting insulin analogues
 - glargine
 - detemir
 - degludec
 - insulin mixtures
 - biphasic analogues
 - stabilized mixtures of human insulins
 - insulin AE
 - hypoglycemia
 - lipodystrophy
 - insulin regimen
 - conventional
 - intensified
 - sites of injection
 - insulin pen
 - insulin pump

Learning outcomes

Student characterizes different types of insulin preparations according to their onset and duration of effect.

Student describes pitfalls of insulin therapy – adverse effects and site of injections.

Student explains the principles of setting the insulin regimen and preparations for the individual model patient.

Student is aware of other drugs used in diabetology, mainly in acute states.

Student briefly describes the principles of gestational diabetes therapy.

Student knows basic pharmacological profile (mode of action, unwanted effects, indications and contraindications) of single subgroups of insulins.

Information sources

Rang & Dale's Pharmacology, 9th edition, 2020 - 32 The control of blood glucose and drug treatment of diabetes mellitus

Study materials for courses aVLFA0721p and aVLFA0721c.

Exam questions

Special pharmacology: 13. Insulins

Essential drugs: 49. insulin analogues

Learning unit: Uterotonics and tocolytics

Relevant terms

uterotonics

oxytocin and its derivatives

oxytocin

carbetocin

synthetic prostaglandins (prostanoids and their derivatives)

dinoprost, carboprost

dinoprostone

ergot alkaloids

methylergometrine (also methylergonovine)

tocolytics

β_2 agonists

terbutaline, hexoprenaline

Ca²⁺ channel blockers

nifedipine, nitrendipine

competitive oxytocin antagonist

atosiban

Learning outcomes

Student knows basic pharmacological profile (mode of action, unwanted effects, indications and contraindications) of uterotonics and tocolytics.

Study materials

Rang & Dale's Pharmacology, 8th edition, 2016, chapter 35, pp. 435-436

Study materials to VLFA07212c and VLFA07212p

Exam questions

Special pharmacology: 15. Analogues and antagonists of hypothalamic-pituitary hormones used in pharmacology; uterotonics and tocolytics

Essential drugs: 36. hexoprenaline, 37. oxytocin

Learning unit: Sex hormones

Relevant terms

gonadoliberin analogs

gosereline

triptoreline

analogues of gonadotropic pituitary hormones (FSH and LH)

follitropin

lutropin

antagonists of gonadotropic pituitary hormones

danazol

analogues and antagonists of peripheral sex hormones

estrogens

natural estrogens

estradiol, estrone, estriol

synthetic estrogens

ethinylestradiol

esters of estradiol

estradiol valerate, estradiol benzoate

estrogen antagonists – antiestrogens

estrogen receptor antagonists

clomiphene

tamoxifen

fulvestrant

tissue selective dualists

raloxifene

peripheral aromatase inhibitors

anastrozole

letrozole

exemestane

gestagens

natural gestagens

progesterone

synthetic gestagens

classification according to the residual androgenic activity:

gestagens with androgenic effect

levonorgestrel

- norethisterone acetate
- gestagens with neutral androgenic effect
 - desogestrel
 - gestoden
 - norgestimate
- gestagens with antiandrogenic effect
 - cyproterone acetate
 - dienogest
 - chlormadinone acetate
- gestagens with antiandrogenic and antimineralocorticoid effects
 - drospirenone
- gestagen antagonists – antigestagens
 - mifepristone
- androgens
 - natural testosterone
 - testosterone esters
- androgen antagonists – antiandrogens
 - androgen receptor antagonists
 - cyproterone acetate (steroid structure)
 - flutamide** (nonsteroid structure)
 - bicalutamide** (nonsteroid structure)
 - 5- α -reductase inhibitors
 - finasteride
- hormonal contraception
 - postcoital – emergency
 - levonorgestrel
 - ulipristal
 - long-term use
 - combined – per oral and parenteral dosage forms
 - phasicity
 - progestin (gestagen) – per oral and parenteral dosage forms
 - APC resistance/ Leiden mutation
 - venous thromboembolism
- hormone replacement therapy (HRT)
 - menopause, climacteric syndrome, estrogen-deficient syndrome, osteoporosis
 - estrogen replacement therapy
 - dosing regimens
 - cyclic
 - continuous
 - dosage forms
 - peroral
 - transdermal

intramuscular
combined replacement (substitution) therapy
 combination of estrogens and gestagens
 continuous gestagen administration
 sequential gestagen administration
combination of estrogens and androgens
STEARS therapy (Selective Tissue Estrogenic Activity Regulators)
 tibolone
SERM therapy (Selective Estrogen Receptor Modulators)
 raloxifene

Learning Outcomes

Student describes the way in which the gonadotropic hypothalamo-pituitary axis can be pharmacologically influenced.

Student lists the individual drug classes and their basic pharmacological profile (mode of action, unwanted effects, indications and contraindications).

Student defines what hormonal contraception is, how it is divided according to usage (postcoital, long-term use), according to the number of components in the product (combined, gestagen ones), according to the dosage form (per oral, parenteral).

Student knows other factors that distinguish the combined oral contraceptives (estrogen dose, gestagen type, phasicity, cyclicity...), knows the mechanism of action, pros, cons, side effects and risks of use.

Student names some examples of significant drug interactions, knows what the hormone replacement therapy is, the advantages and disadvantages etc.

Study materials

Rang & Dale's Pharmacology, 8th edition, 2016, 35, pp. 425-435

Study materials for courses aVLFA0721p and aVLFA0721c.

Exam questions

Special pharmacology: 14. Analogues and antagonists of estrogens, gestagens and androgens; HRT, hormonal contraception . 15. Analogues and antagonists of hypothalamic-pituitary hormones used in pharmacology; uterotonics and tocolytics

Essential drugs: 33. ethinylestradiol, 34. cyproterone, 35. tamoxifen, 38. levonorgestrel

Learning unit: Principles of immunotherapy

Impact of the learning unit:

Immunologic mechanisms of action are used therapeutically in different indications. For instance, immune suppression in rheumatology or transplantology, and immune stimulation in infectious diseases and oncology. Physicians need to know how to pharmacologically influence immune functions and which drugs are used for it.

Relevant terms

immunosuppressants

- immune suppression as adverse effect
- glucocorticoids
 - iatrogenic Cushing syndrome
 - prevention of adverse effects
 - dosing regimes
 - classification with respect to
 - strength of antiphlogistic effect
 - biological half-life
 - hydrocortisone
 - fludrocortisone
 - prednisone
 - methylprednisolone
 - prednisolone
 - triamcinolone
 - dexamethasone
 - betamethasone
- calcineurin inhibitors
 - ciclosporin A
 - tacrolimus
- mTOR inhibitors
 - sirolimus
- antimetabolites
 - methotrexate
 - azathioprine
 - mycophenolate mofetil

immunostimulants

- autoimmune adverse effects
- cytokines
 - interferon alpha
 - interferon beta
 - interferon gamma
 - normal human immunoglobulin
- dendritic cell therapy as an example of somatic cell immunotherapy

Learning outcomes

Student explains the mechanism of effect of selected immunosuppressants and immunostimulants and derives their adverse effects.

Student is oriented in general indications of immunosuppressant and immunostimulants and gives examples of drugs and their clinical use.

Student knows basic pharmacological profile (mode of action, unwanted effects, indications and contraindications) of immunostimulants and suppressants.

Student knows synthetic glucocorticoids, their potency, and duration of effect.

Student chooses appropriate dosage form according to the indication of glucocorticoid. Student describes the adverse effects of long-term glucocorticoid therapy and how to manage them.

Student knows basic pharmacological profile (mode of action, unwanted effects, indications and contraindications) of glucocorticoids.

Study materials

Lecture

Rang & Dale's Pharmacology, 9th edition, 2020, chapter 27.

Study materials for courses aVLFA0721p and aVLFA0721c.

Exam questions

Special pharmacology: Glucocorticoids

Immunostimulants + immunosuppressants (except glucocorticoids)

Essential drugs: prednisone, cyclosporine, interferons, methotrexat

Learning unit: Biological therapy of autoimmune diseases

Impact of the learning unit

Obtaining knowledge about biological drugs used in the treatment of autoimmune diseases, including psoriasis, rheumatoid arthritis, ankylosing spondylarthritis, multiple sclerosis, systemic lupus erythematosus and non-specific intestinal inflammation (see Antiulcer drugs and other drugs used in GIT). It is a fast-developing area of pharmacotherapy, using innovative biological medicinal products targeted therapy. Other drugs for autoimmune diseases include immunosuppressants, which are described elsewhere (Principles of Immunotherapy).

Important terms

autoimmune diseases

signalling paths

tyrosine kinases

cytokines regulating immune response

anti-TNF α drugs

- infliximab
- adalimumab
- etanercept
- certolizumab

anti-IL drugs

- ustekinumab
- anakinra
- tocilizumab

T cells targeting drugs

- abatacept
- natalizumab

B cells targeting drugs

- rituximab
- belimumab

interferon beta

immunosuppressants

- see question outline Immunopharmacology

Learning outcomes

The student knows the basic principles of biological therapy, differences in the principle of biological treatment effects.

The student is able to describe basic approaches to the treatment of selected autoimmune diseases (psoriasis, rheumatoid arthritis, ankylosing spondylarthritis, multiple sclerosis, non-specific intestinal inflammation, systemic lupus erythematosus).

The student knows the basic representatives of individual therapeutic approaches to the treatment of autoimmune diseases.

Recommended study materials

Rang & Dale's Pharmacology, Humphrey Rang 9th edition, 2020, Chapter 5, 27.

Study materials of the course aVLFA0721c, aVLFA0721p, aVLFA0822c and aVLFA0822p.

Exam questions

General Pharmacology: Principles of biological therapy – classification, technology, examples of use

Special pharmacology: Biological treatment of autoimmune diseases

“Essential” drugs: interferons

Learning unit: Drugs used in osteoporosis, pharmacology of thyroid gland

Impact of the learning unit

Learning unit summarises substances used for the treatment of osteoporosis and thyroid gland diseases.

Important terms

drugs used in osteoporosis

- antiresorptive drugs
 - bisphosphonates
 - bisphosphonates without nitrogen
 - clodronate (hypercalcemia treatment only)
 - aminobisphosphonates
 - ibandronate (ibandronic acid)
 - zoledronate (zoledronic acid)
- denosumab
- selective modulators of estrogenic receptors (SERM)
 - raloxifene
 - see learning unit Sex hormones
- osteoanabolic drugs
 - analogues of parathormone
 - teriparatide
- drugs with combined mechanism of action
 - strontium ranelate
 - calcium + vitamin D see learning unit Vitamins

drugs used in hypothyroidism

- levothyroxine
- liothyronine

drugs used in hyperthyroidism

- thionamides (thioamides, thioureylenes)
 - propylthiouracil
 - carbimazole
- high-dose iodides
- adjuvant treatment
 - beta blockers
 - glucocorticoids
- radioiodine (¹³¹I)

Learning outcomes

Student knows basic pharmacological profile (mechanism of action, adverse effects, route of administration, other indications) of the particular groups of drugs used in the treatment of osteoporosis and thyroid gland diseases.

Recommended study materials

Rang & Dale's Pharmacology, Humphrey Rang 9th edition, 2020, chapter 35 and 37.

Study materials of the course aVLFA0721p, VLFA0721c, aVLFA0822p and aVLFA0822c.

Exam questions

Special pharmacology: Drugs used in osteoporosis, pharmacology of thyroid gland

Learning unit: H₁ antihistamines

Impact of the learning unit

H₁ antihistamines are indispensable drugs in the treatment of allergies. They block histamine H₁ receptors, preventing the major mediator of allergic reactions - histamine.

Relevant terms

histamine receptors
antihistamines
inverse antagonism

- H₁ antihistamines
 - H₁ antihistamines of 1st generation
 - bisulepin
 - dimetinden
 - promethazine
 - moxastine
 - H₁ antihistamines of 2nd generation
 - cetirizine
 - loratadine
 - azelastine
 - levocabastine
 - H₁ antihistamines of 3rd generation
 - levocetirizine
 - desloratadine
 - bilastine
 - rupatadine
 - H₃ antihistamines
 - betahistine
- paradoxical stimulation

Learning outcomes

Student knows the principles of antagonizing the effects of histamine.

Student will present examples of antihistamines of the 1st - 3rd generation and example of H₃ antihistamines (betahistine).

Student knows the main differences between antihistamines 1st, 2nd and 3rd generation.

Student knows basic pharmacological profile (mode of action, unwanted effects, indications and contraindications) of antihistamines.

Recommended study materials

RITTER, James, R. J. FLOWER, Graeme HENDERSON, Yoon Kong LOKE, David J. MACEWAN a H. P. RANG. *Rang and Dale's pharmacology*. Ninth edition. Edinburgh: Elsevier, 2020. xvi, 789. ISBN 9780702074486.

Study materials in IS aVLFA0822p and aVLFA0822c.

Exam questions

Special pharmacology: 21. H₁ antihistamines

Essential drugs: cetirizine, betahistine

Learning unit: Drugs used for treatment of diseases with chronic bronchial obstruction

Impact of the learning unit

The learning unit provides the basic knowledges and overview of drug groups and their main agents used to treat chronic bronchial obstructive diseases including asthma bronchiale and chronic obstructive pulmonary disease.

Important terms

bronchodilators

- β 2-adrenoreceptor agonists
 - SABA (RABA)
 - salbutamol
 - fenoterol
 - LABA
 - salmeterol
 - clenbuterol
 - U-LABA
 - indacaterol
 - vilanterol
 - RABA
 - formoterol
- parasympatolytics
 - SAMA
 - ipratropium-bromide
 - LAMA
 - aclidinium
 - U-LAMA
 - tiotropium
 - umeclidinium
 - glycopyrronium
- methylxantines
 - theophylline
 - aminophylline

glucocorticoids

- systemic administration
 - prednisone
 - methylprednisolone
 - hydrocortizone
- given by inhalation
 - beclomethasone
 - budesonide
 - fluticasone

immunoprophylactics (mast cells stabilizers)

- ketotifen
- cromoglycate

antileukotrienes

- montelukast

anti-IgE treatment

- omalizumab

inhibitor of phosphodiesterase 4

- roflumilast

Learning outcomes

Student knows pharmacotherapeutic approaches to treatment of diseases with chronic bronchial obstruction.

Student is able to name the basic groups of drugs used in the treatment of diseases with chronic bronchial obstruction and their main representatives.

Student knows the basic pharmacological profile (mechanism of action, side effects, indications and contraindications) of drugs used to treat diseases with chronic bronchial obstruction.

Recommended study materials

Rang & Dale's Pharmacology, Humphrey Rang, 9th edition, 2020, chapter 29, pg. 371

Study materials in IS aVLFA0822p and aVLFA0822c.

Exam questions

Special pharmacology: 19. Drugs used for treatment of diseases with chronic bronchial obstruction

Essential drugs: salbutamol, ipratropium-bromide

Learning unit: Antitussive and mucoactive drugs

Important terms

Antitussive drugs

- central acting antitussives
 - opioid antitussives
 - codeine
 - dextromethorphan
 - non-opioid antitussive
 - butamirate
- peripherally acting antitussives
 - dropropizine
 - levodropropizine

Mucoactive drugs

- mucolytics
 - erdosteine
 - N-acetylcysteine
- drugs with combined mechanism of action
 - bromhexine
 - ambroxol
 - guaifenesin

Learning outcomes

Student knows the classification of antitussive drugs.

Student knows basic pharmacological profile (mode of action, unwanted effects, indications and contraindications) of antitussives.

Student knows the basic indications and contraindications of antitussives.

Student knows basic pharmacological profile (mode of action, unwanted effects, indications and contraindications) of mucoactive substances.

Recommended study materials

Study materials in IS aVLFA0822p and aVLFA0822c.

Exam questions

Special pharmacology: 20. Antitussives, mucoactive drugs

„Essential“ drugs: codeine, acetylcysteine

Learning unit: Antipsychotic drugs

Impact of the learning unit

Learning outcomes of the learning unit are to introduce the group of drugs used in psychotic illnesses and to acquaint students with issues of the therapy of these disorders. Antipsychotics are also used to treat other than psychotic illnesses, these include bipolar disorder, depression, severe anxiety, nausea, vomiting and so on. The knowledge of their pharmacology is necessary for a variety of specializations (intensive medicine, oncology, general practitioner, addictology, ...).

Relevant terms

typical antipsychotics

- basal antipsychotics
 - levomepromazine
 - thioridazine
- incisive antipsychotics
 - flupentixol
 - haloperidol

atypical antipsychotics

- D2/D3 antagonist
 - amisulpride
- SDA (Serotonin-Dopamine Antagonist)
 - risperidone
 - lurasidone
- MARTA (Multi Acting Receptor Targeted Antagonist)
 - olanzapine
 - clozapine
 - quetiapine
- PDA (Partial Dopamine Agonist)
 - aripiprazole

pathophysiology of psychosis

- positive symptoms
- negative symptoms

adverse effects of antipsychotics

- extrapyramidal side effects
- secondary parkinsonism
- tardive dyskinesia
- antipsychotic malignant syndrome
- hyperprolactinemia

Learning outcomes

Student knows basic classification of antipsychotic drug.

Student knows basic pharmacological profile (mode of action, unwanted effects, indications and contraindications) of antipsychotics.

Student enumerates the major antipsychotic drugs.

Study literature

Rang & Dale's Pharmacology, 9th ed., 2020

Study materials in IS aVLFA0822c and aVLFA08222p.

Exam questions

Special pharmacology: 22. Antipsychotics

„*Essential*“ drugs: 47. haloperidol, 48. olanzapine

Learning unit: Antiparkinsonics

Impact of the learning unit

Parkinsonism, along with Alzheimer's disease, is one of the most common neurodegenerative diseases. Extrapyrimal symptoms, i.e., a typical symptomatology of this disease, may also be a manifestation of toxicity or the adverse effect of other medication administered.

Conversely, administration of some antiparkinsonic drugs due to increased dopaminergic activity may lead to numerous adverse effects, including neuropsychiatric. The aim of the learning unit is to introduce students to the problems of pharmacotherapy of parkinsonism and extrapyramidal symptoms of neuropsychiatric drugs, especially antipsychotics.

Important terms

antiparkinsonics

- dopamine precursors
 - levodopa
- dopaminergic agonists
 - pramipexol
 - ropinirol
- MAO B inhibitors
 - selegiline
- amantadine
- antimuscarinics
 - biperiden

antiparkinsonic drugs combination

- DOPA-decarboxylase inhibitors
 - carbidopa
 - benserazide
- COMT inhibitors
 - entacapone
 - tolcapone

extrapyramidal syndrome as an adverse effect of drugs

Learning outcomes

Student mentions the drugs used in Parkinson's disease therapy.

Student knows the basic pharmacological profile of antiparkinsonics (mechanism of action, adverse effects, indications and contraindications).

Student can explain the reasons for combining antiparkinsonic drugs.

Student can name examples of drugs inducing extrapyramidal syndrome.

Information resources

Rang & Dale's Pharmacology, 9th ed., 2020

Study materials in IS aVLFA0822c and aVLFA08222p.

Exam Questions

Special pharmacology: 23. Drugs of neurodegenerative diseases (Parkinson's disease; dementia)

"Essential" drugs: 48. levodopa/carbidopa

Learning unit: Antidepressants

Important terms

tricyclic antidepressants (TCA)

- amitriptyline
- imipramine
- dosulepin
- clomipramine

selective neurotransmitter uptake inhibitors

- SSRI
 - fluoxetine
 - citalopram
 - escitalopram
 - paroxetine
- NARI
 - reboxetine

dual antidepressants

- NDRI
 - bupropion
- SNRI
 - venlafaxine
 - duloxetine
- NASSA
 - mirtazapine

antidepressants influencing mainly serotonergic systems

- SARI
 - trazodone
- SMS
 - vortioxetine

NMDA receptor antagonists

- esketamine

MT receptor agonists

- MASSA
 - agomelatine

inhibitors of monoamine biodegradation

- selective MAO-A inhibitors
 - moclobemide

antidepressants used in bipolar affective disorder

- lithium
- atypical antipsychotics
- anticonvulsants

Learning outcomes

The student knows the drug's basic pharmacological profile (mechanism of action, side effects, indications and contraindications) of antidepressants.

The student provides an overview of the indications of individual pharmacological groups of antidepressants and knows their side effects.

The student is able to explain the choice of a specific antidepressant based on its adverse effects/side effects.

Information sources

Rang & Dale's Pharmacology, 9th edition, 2020, chapter 48 Antidepressant drugs, pp. 603-622.

Study materials in the IS – subjects aVLFA0822p and aVLFA0822c.

Exam questions

Special pharmacology: 24. Antidepressants – MAOI, SSRI, NDRI

25. Antidepressants - TCA, NASSA, MASSA, SARI, SNRI, NARI, SMS

Essential drugs: escitalopram, lithium, mirtazapine

Learning unit: Cognition-enhancing drugs (Nootropics and anti-dementia drugs)

Important terms

anti-dementia drugs

- reversible acetylcholinesterase inhibitors
 - donepezil
 - galantamine
 - rivastigmine
- NMDA receptor antagonists
 - memantine

nootropics (“smart drugs“)

- piracetam
- vinpocetine
- vasodilators of cerebral vessels
 - cinnarizine
 - pentoxifylline
 - naftidrofuryl

Learning outcomes

Student knows basic pharmacological profile (mode of action, adverse effects, indications and contraindications) of anti-dementia drugs and nootropics.

Student lists the main representatives of cognition-enhancing drugs.

Student gives examples of pathological states in which nootropics and anti-dementia drugs are clinically used.

Information sources

Rang & Dale's Pharmacology, 9th edition, 2020, chapter 41 Neurodegenerative diseases, pp. 514-530, chapter 49 Psychoactive drugs, pp. 623-641.

Study materials in the IS – subjects aVLFA0822p and aVLFA0822c.

Exam questions

Special pharmacology: 26. Nootropics. Anti-dementia drugs.

Essential drugs: rivastigmine

Learning unit: Psychoactive drugs (Psychomimetics)

Important terms

Psychostimulants

- psychostimulants increasing noradrenaline and dopamine release
 - modafinil
 - amphetamine/dextroamphetamine (dexamfetamine)
 - methamphetamine
 - ephedrine/pseudoephedrine
 - phentermine
- inhibitors of noradrenaline and dopamine reuptake
 - methylphenidate
 - atomoxetine
 - cocaine
- methylxanthines
 - caffeine
 - theophylline
- nicotine

Psychotomimetics

- lysergide - diethylamide of lysergic acid (LSD)
- psilocin, psilocybin
- mescaline
- cannabinoids (THC)
- atropine, scopolamine (hyoscine)
- ketamine
- methylenedioxymethamphetamine (MDMA, ecstasy)

Learning outcomes

Student knows basic pharmacological profile (mode of action, adverse effects, indications, contraindications) of psychoactive drugs.

Student gives examples of the main representatives of psychoactive drugs.

Student explains the mechanisms involved in addiction to psychostimulants.

Information sources

Rang & Dale's Pharmacology, 9th edition, 2020, chapter 49 Psychoactive drugs, pp. 623-641

Study materials in the IS – subjects aVLFA0822p and aVLFA0822c

Exam questions

Special pharmacology: 27. Psychostimulants. Drugs used in ADHD. Psychotomimetics.

Essential drugs: methylphenidate

Learning unit: Anticonvulsants

Relevant terms:

antiepileptic drugs

- antiepileptic drugs reducing presynaptic excitability and release of neurotransmitters
 - inhibition of sodium channel function
 - phenytoin
 - carbamazepine
 - lamotrigine
 - inhibition of calcium channel function
 - gabapentin
 - pregabalin
 - ethosuximide
 - modulation of the synaptic vesicular SV2A protein
 - levetiracetam
- antiepileptic drugs enhancing GABA action
 - clonazepam
 - diazepam
 - phenobarbital
 - tiagabine
 - vigabatrin
- antiepileptic drugs with multiple mechanisms of action
 - valproate
 - topiramate

adverse effects and teratogenicity of antiepileptic drugs

Learning outcomes

Student knows basic pharmacological profile (mode of action, unwanted effects, indications and contraindications) of antiepileptic drugs.

Student knows the interaction potential of anticonvulsants.

Student knows the specifics of pharmacotherapy of antiepileptics in pregnant women.

Study literature

Rang & Dale's Pharmacology, 9th edition, 2020-chapter 46, pp. 580-590.

Study materials in IS aVLFA0822c and aVLFA08222p.

Exam questions

Special pharmacology: 28. Anticonvulsants

„*Essential*“ drugs: 40. gabapentin, 52. carbamazepine, 61. valproic acid

Learning unit: Anxiolytic drugs

Important terms

benzodiazepine anxiolytics

- alprazolam
- bromazepam
- oxazepam

non-benzodiazepine anxiolytics affecting GABA-ergic neurotransmission

- pregabalin

non-benzodiazepine anxiolytics of other pharmacologic groups

- antidepressant drugs
 - SSRI – citalopram, escitalopram, fluoxetine, sertraline
 - SNRI – venlafaxine
 - other – mirtazapine, trazodone
- H1-antihistamines
 - hydroxyzine
- beta-blockers
 - metoprolol
- antipsychotics
 - MARTA-olanzapine
 - SDA – ziprasidone
 - aripiprazol
- other
 - guaifenesin
 - buspirone

herbal anxiolytics

antidotum of benzodiazepines

- flumazenil

Learning outcomes

Student knows clinically used anxiolytics and can divide them into main groups.

Student knows basic pharmacological profile (mode of action, unwanted effects, indications and contraindications) of anxiolytic groups.

Student can classify benzodiazepine anxiolytics, non-benzodiazepine anxiolytics and substances of other pharmacologic groups used for treatment of anxiety including their representatives.

Student can list non-psychiatric indications of anxiolytics.

Recommended study materials:

Rang & Dale's Pharmacology, 9th edition, 2020-chapter 45: Anxiolytic and hypnotic drugs, pp . 569-579.

Study materials of the course aVLFA0822c and aVLFA0822p

Exam questions

Special pharmacology: 29. Hypnosedatives, anxiolytics

„Essential“ drugs: 30. escitalopram, 78. mirtazapine, 22. diazepam

Learning unit: Hypnosedatives

Important terms

benzodiazepines

- midazolam
- diazepam

„Z“ substances

- zopiclone
- zolpidem
- eszopiclone

antidepressant drugs used for treatment of insomnia

- trazodone
- agomelatine
- mirtazapine
- dosulepine

drugs affecting circadian rhythms

- melatonin

H₁ antihistamines (I. generation)

- promethazine
- moxastin
- bisulepine

medicinal herbs as hypnosedatives

dependency on hypnosedatives

Learning outcomes

Student can describe substances of the individual groups and mechanisms of their action.

Student knows indications of hypnosedatives.

Student knows risks of long-term use of hypnosedatives.

Recommended study materials:

Rang & Dale's Pharmacology, 9th edition, 2020-chapter 45: Anxiolytic and hypnotic drugs, pp. 569-578.

Study materials of the course aVLFA0822c and aVLFA0822p

Exam questions

Special pharmacology: 29. Hypnosedatives, anxiolytics

„Essential“ drugs: 113. zolpidem, 22. diazepam

Learning unit: Substance abuse, addiction and its treatment

Important terms

neuronal reward pathways

repeated administration

sensitization

desensitization

tolerance

physical dependence

psychological dependence

craving

neuroplasticity

Withdrawal symptoms

overdosing

substitution therapy

- opioid dependence
 - substitution therapy
 - methadone
 - buprenorphine
 - therapy blocking response to opioids
 - naltrexone
 - withdrawal syndrome therapy
 - clonidine
 - beta-blockers
 - benzodiazepines
 - clomethiazole
- alcohol dependence
 - aversive therapy
 - disulfiram
 - anticraving therapy
 - acamprosate
 - therapy blocking response to alcohol
 - naltrexone
 - nalmefene
 - withdrawal syndrome therapy
 - clonidine
 - beta-blockers
 - benzodiazepines

- clomethiazole
- nicotine dependence
 - substitution therapy
 - nicotine
 - varenicline
 - anticraving therapy
 - bupropion
 - clonidine
- hypnosedative dependence
 - symptomatic therapy
- psychostimulant dependence
 - symptomatic therapy

Learning outcomes

Student knows influence of repeated administration on effect of medical substances.

Student explains terms: tolerance, tachyphylaxis, up-regulation, down-regulation, internalization of receptors.

Student knows mechanisms leading to development of dependency on medical substances.

Student knows neuronal circuits of reward system.

Student knows most frequently abused substances and can suggest therapy of their intoxication and cessation.

Recommended study materials

Rang & Dale's Pharmacology 9th edition, 2020, chapter 50, pp.642-647.

Study materials of the course aVLFA0822c and aVLFA0822p.

Exam questions

Special pharmacology:

60. Drugs causing addiction and substances used for treatment of addiction

“Essential” drugs: 70. methadone, 12. buprenorphine

Learning unit: Vasodilators

Relevant terms

calcium channel blockers

- vasoselectivity
- reflex tachycardia
- dihydropyridines
 - short half-life drugs, less vasoselective
 - **nifedipine** (SR only – slow release)
 - medium-long half-life drugs
 - **felodipine**
 - long half-life drugs, highly vasoselective
 - **amlodipine**
- non-dihydropyridines
 - diltiazem
 - verapamil

nitrites and NO donors

- nitrites
 - rescue therapy
 - glycerol **trinitrite** (nitroglycerin)
 - tachyphylaxis
 - isosorbide **dinitrite** (ISDN)
 - chronic therapy
 - isosorbide **dinitrite** (ISDN)
 - controlled release
 - isosorbide **mononitrite** (ISMN)
 - tolerance
 - controlled release
- NO donors
 - molsidomine

PDE-5 inhibitors

- **sildenafil**
- **avanafil**
- **tadalafil**

endothelin-1 antagonists

prostacyclin synthetic analogues

Learning outcomes

The student knows the basic strategies how to induce vascular smooth muscle relaxation. The student knows particular drug groups classified as vasodilators (list the most important drugs in particular groups), knows their detailed mechanisms of action, indications, contraindication and adverse drug effects.

Study literature

Rang & Dale's Pharmacology, Humphrey Rang 9th edition, 2020, chapter 23 (pg. 290)

Study materials for courses aVLFA0822p and aVLFA0822c.

Exam questions

Special pharmacology: 50. Nitrates and other vasodilators, 54. Calcium channel blockers, α 1 lytics, 62. Drugs used in erectile dysfunction and BPH

Essential drugs: 51. isosorbid-dinitrate/nitroglycerin, 7. amlodipine, 110. verapamil, 99. sildenafil

Learning unit: Lipid lowering drugs (Hypolipidaemics) and anti-obesity drugs

Relevant terms

lipid lowering drugs

statins

- atorvastatin
- rosuvastatin
- lovastatin
- fluvastatin
- simvastatin
- elevation of liver transaminases
- drug-drug interactions

fibrates

- fenofibrate
- ciprofibrate

cholesterol absorption inhibitors

- ezetimibe

bile acid sequestrants (resins)

- colesevelam

omega 3 fatty acids (PUFA)

PCSK 9 inhibitors

- evolocumab

MTP inhibitors (microsomal triglyceride transferring protein inhibitors)

combinations of the lipid-lowering drugs

rhabdomyolysis

anti-obesity drugs

drugs decreasing lipid absorption (pancreatic lipase inhibitors)

- orlistat

centrally acting drugs (anorectics)

- phentermine
- bupropion/naltrexone

weight gain/loss as a side effect of drugs

Learning outcomes

Student knows the basic pharmacological profile (mechanism of action, side effects, indications and contraindications) of drugs used to treat hyperlipidaemias and anti-obesity drugs.

Study literature

Rang & Dale's Pharmacology, Humphrey Rang 9th edition, 2020, chapters 24 and 33

Study materials for courses aVLFA0822p and aVLFA0822c.

Exam questions

Special pharmacology: 49. Hypolipidaemics, anti-obesity drugs

Essential drugs: 9. atorvastatin, 32. ezetimibe

Learning unit: Drugs influencing RAAS

Relevant terms

ACE inhibitors

- short-acting ACEIs
 - captopril
- medium-acting ACEIs
 - enalapril
- long-acting ACEIs
 - ramipril
 - perindopril
- dry cough

sartans – angiotensin (AT1) receptor blockers

- short-acting ARBs
 - losartan
- medium-acting ARBs
 - valsartan
 - candesartan
- long-acting ARBs
 - telmisartan

ARNI – combined preparation: ARB + neprilysin inhibitor (valsartan + sacubitril)

renin inhibitors

- aliskiren

cardioprotective, renoprotective effects

angioedema

intrauterine growth retardation, foetal renal dysplasia

drug interactions

diuretics influencing RAAS

Learning outcomes

Student provides a review of drug groups influencing the Renin-Angiotensin-Aldosterone System (RAAS).

Student describes pharmacological profiles (mechanisms of action, adverse effects, indications and contraindications) of drugs influencing the RAAS.

Student explains the extrarenal effects of drugs interfering with the RAAS.

Recommended literature

Rang & Dale's Pharmacology, 9th edition, 2020

Study materials in the IS – subject codes aVLFA0822c and aVLFA0822p

Exam questions

Special pharmacology: 51. Drugs influencing RAAS, 52. Diuretics and aldosterone antagonists.

Essential drugs: 91. perindopril, 105. telmisartan

Learning unit: Drugs affecting diuresis

Important terms

drugs used in cardiovascular diseases

- thiazide diuretics (decreased diuretic effect in renal insufficiency)
 - hydrochlorothiazide
 - **indapamide**
- loop diuretics
 - furosemide
- potassium-sparing diuretics
 - amiloride
 - aldosterone receptor antagonists
 - spironolactone
 - mineralocorticoid receptor antagonists
 - eplerenone
- natriuretic peptides

drugs used in other indications

- carbonic anhydrase inhibitors
 - acetazolamide
 - acid-base disorders
 - glaucoma
- osmotic diuretics
 - mannitol
 - forced diuresis, treatment of intracranial hypertension

hypokalaemia, hyperkalaemia, acid-base disorders

Learning outcomes

Student describes the basic pharmacological profile of diuretics (mechanisms of action by which individual groups of diuretics affect the diuresis, adverse effects, indications and contraindications).

Student knows the combination potential of diuretics within the group of antihypertensive drugs.

Recommended literature

Rang & Dale's Pharmacology, 9th edition, 2020

Study materials in the IS for courses aVLFA0822p and aVLFA0822c

Exam questions

Special pharmacology: 52. Diuretics and aldosterone antagonists

Essential drugs: 39. furosemide, 46. indapamide, 101. spironolactone

Learning unit: Antihypertensives

Relevant terms

First-line antihypertensives

- Angiotensin-converting enzyme (ACE) inhibitors
 - see Learning unit **Drugs influencing RAAS**
- Angiotensin (AT1) receptor blockers
 - see Learning unit **Drugs influencing RAAS**
- Calcium channel blockers, dihydropyridines
 - see Learning unit **Vasodilators**
- Diuretics
 - thiazides, loop diuretics, potassium-sparing diuretics, aldosterone receptor blockers
 - see Learning unit **Drugs affecting diuresis**
- Beta blockers (beta-lytics)
 - see Learning unit **Drugs influencing myocytes - drugs with negative chronotropic effects**

Second-line antihypertensives

- Central antihypertensives
 - Central alpha2 receptor agonists
 - see Learning unit **Sympathotropic agents**
 - methyldopa
 - clonidine
 - Agonists of imidazoline I1 receptors
 - moxonidine
 - rilmenidine
 - Combined agonists of central alpha2 receptors and antagonists of peripheral alpha1 receptors
 - urapidil
 - Peripheral alpha1 receptor blockers (alpha1-lytics)
 - terazosin
 - doxazosin
 - see Learning unit **Sympathotropic agents**
- Nitrates and NO donors
 - see Learning unit **Vasodilators**
- Renin inhibitors
 - see Learning unit **Drugs influencing RAAS**

hypertension in pregnancy (pre-existing and gestational hypertension)

- methyldopa
- labetalol

hypertensive crisis

- furosemide
- urapidil
- nitrates
- clonidine

Learning outcomes

Student describes pharmacological profiles (mechanisms of action, adverse effects, indications and contraindications) of antihypertensive drugs.
Student gives the list of first-line antihypertensives and second-line antihypertensives.
Student provides the list of antihypertensives available for the pharmacotherapy of hypertension in pregnancy, in patients with diabetes mellitus/metabolic syndrome.
Student explains the principles of combination therapy of hypertension.
Student gives examples of drugs used in the therapy of hypertensive crisis.

Recommended literature

Rang & Dale's Pharmacology, 9th edition, 2020, Chapters 22-23
Study materials in the IS – subject codes aVLFA0822c and aVLFA0822p

Exam questions

Special pharmacology: 53. Beta blockers and central antihypertensives, 54. Calcium channel blockers, alpha1-lytics

Essential drugs: 7. amlodipine, 25. doxazosin, 39. furosemide, 46. indapamide, 51. isosorbide dinitrate, 73. methyldopa, 75. metoprolol, 91. perindopril, 101. spironolactone, 105. telmisartan

Learning unit: Drugs acting on the heart

Relevant terms

Drugs with negative chronotropic effect on the heart

- beta blockers
 - indications
 - contraindications
 - adverse effects

 - drugs
 - cardioselective (beta1) blockers
 - metoprolol
 - atenolol
 - bisoprolol
 - esmolol
 - betaxolol
 - cardioselective (beta1) blockers with ISA (partial agonists)
 - acebutolol
 - celiprolol
 - with combined mode of action (nonselective beta blocker, selective alfa1 blockers)
 - labetalol
 - carvedilol

- bradines
 - ivabradine

- calcium channel blockers: non-dihydropyridines
 - diltiazem
 - verapamil

Drugs with positive inotropic effect on the heart

- cardiac glycosides – cardiotonics
 - digoxin
- nonselective and cardioselective betamimetics
 - adrenaline, dobutamine (inodilators)
 - noradrenaline, dopamine (inoconstrictors)
- PDE3 inhibitors
 - milrinone
- calcium sensitizers
 - levosimendan

Drugs with antiarrhythmic influence on the myocardium

- class 1 - sodium channel inhibiting antiarrhythmics

- 1a – quinidine
- 1b – lidocaine
- 1c – propafenone
- class 2 – beta-adrenoceptor inhibiting antiarrhythmics
 - bisoprolol
 - metoprolol
 - esmolol
- class 3 – potassium channel inhibiting antiarrhythmics
 - amiodarone

thyroid disorders
pulmonary fibrosis

 - sotalol
- class 4 – calcium channel inhibiting antiarrhythmics
 - verapamil
- antiarrhythmics not classified in Vaughan-Williams classification
 - adenosine
 - atropine
 - digoxin

risk of arrhythmogenic effect of antiarrhythmics

Drugs acting on the coronary vessels

- nitrates
 - rescue therapy/fast onset of action
 - glycerol trinitrate (nitro-glycerine)

tachyphylaxis

 - isosorbide dinitrate (ISDN)
 - slow onset of action
 - isosorbide mononitrate (ISMN)
- NO donors
 - molsidomine
- calcium channel blockers: non-dihydropyridines
 - diltiazem
 - verapamil

Learning outcomes

Student knows basic pharmacological profile (mechanism of action, side effects, indications and contraindications) of drugs acting on the heart. Student knows typical indications, in which are these drugs used.

Study literature

Rang & Dale's Pharmacology, 9th edition, 2020, chapter 22, pp. 271-290

Study materials of the courses aVLFA0822c and aVLFA0822p

Exam questions

Special pharmacology:

50. Nitrates and other vasodilators

53. Beta blockers + central antihypertensives

54. Calcium channel blockers, α 1-lytics

55. Antiarrhythmic

56. Positive inotropic drugs

"Essential drugs": 6. amiodaron, 23. digoxin, 51. isosorbide dinitrate, 75. metoprolol, 110. verapamil

Learning unit: Drugs affecting haemostasis

Relevant terms

anticoagulants

- interfering directly with the process of haemocoagulation
 - heparin and its derivatives
 - unfractionated heparin (UFH)
 - low molecular weight heparin (LMWH)
 - **dalteparin**
 - **enoxaparin**
 - **nadroparin**
 - protamine sulfate
 - HIT
 - aPTT
 - thrombin inhibitors
 - **dabigatran**
 - direct factor Xa inhibitors
 - **rivaroxaban**
 - **apixaban**
 - **edoxaban**
 - specific reversal agents for gatrans and xabans
- vitamin K antagonists
 - warfarin
 - INR

fibrinolytics / thrombolytics

- **alteplase**
- **reteplase**
- **tenecteplase**

antifibrinolytics

- tranexamic acid
- aminomethylbenzoic acid

antiplatelet agents

- COX inhibitors
 - ASA
 - indobufen
- PDE inhibitors

- drugs inhibiting the formation of fibrinogen bridges between platelets
 - antagonists of P2Y₁₂ purinergic receptor for ADP
 - thienopyridines
 - clopidogrel
 - prasugrel
 - non-thienopyridines
 - ticagrelor
 - cangrelor
 - antagonists of glycoprotein IIb / IIIa receptor for fibrinogen
 - eptifibatide

venoactive drugs

- sulodexide
- naftidrofuryl
- cilostazol
- pentoxifylline

haemostatics

- systemic
 - with vasoconstrictor effect
 - vasopressin derivatives (terlipressin, desmopressin)
 - without vasoconstrictor effect
 - etamsylate
- local
 - carboxycellulose
 - fibrin sealant
 - bi-component tissue adhesives (fibrinogen + aprotinin with thrombin)
 - gelatin, gelatin sponge

antianaemics

- iron
 - iron (II) salts - ferrous sulfate, fumarate, gluconate
 - iron (III) salts - ferric complexes
 - administration routes (oral, parenteral)
- vitamin B₁₂
- folic acid
- haemopoietic growth factors
 - erythropoietin
 - epoetin alfa, beta, zeta
 - darbepoetin

Learning outcomes

Student knows to name the various drug groups affecting haemostasis.

Student knows the basic pharmacological profile (mechanism of action, side effects, indications and contraindications) of anticoagulants.

Student knows the basic pharmacological profile (mechanism of action, side effects, indications and contraindications) of antiplatelet agents

Student knows the basic pharmacological profile (mechanism of action, side effects, indications and contraindications) of fibrinolytics and antifibrinolytics.

Student knows the basic pharmacological profile (mechanism of action, side effects, indications and contraindications) of haemostatics and antianaemics.

Study literature

Rang & Dale's Pharmacology 9th edition, 2020, Chapters 25 and 26

Study materials in the IS for subjects aVLFA0822c and aVLFA0822p

Exam questions

Special pharmacology: 57. Antiplatelet drugs, antianaemics, 58. Fibrinolytics and antifibrinolytics, haemostatics, 59. Anticoagulants

“Essential” drugs: 20. dabigatran, 29. enoxaparin, 56. clopidogrel, 96. rivaroxaban, 111. warfarin

Learning unit: Antimicrobial drugs

Impact of the learning unit

This learning unit aims to teach students to characterize and distinguish the basic classes of antibacterial drugs and basic principles of antimicrobial chemotherapy. Knowledge of the mechanisms of action of individual representatives, their adverse effects, antimicrobial spectrum, and specifics of rational use of antimicrobial agents is within the competence of each practitioner. It is the basic knowledge of every student of medicine.

Important terms

effect of ATBs

- with respect to intensity
 - o bacteriostatic
 - o bactericidal
- with respect to parameter
 - o time dependent
 - o concentration dependant
 - o AUC dependant

minimum inhibitory concentration (MIC)

minimum bactericidal concentration (MBC)

minimum antibacterial concentration (MAC)

post-antibiotic effect

resistance to antibacterial drugs

- types
- mechanisms

beta-lactams

- penicillins
 - o benzylpenicillin
 - o phenoxymethylpenicillin
 - o oxacillin
 - o piperacillin/piperacillin-tazobactam
- aminopenicillins
 - o ampicillin/ampicillin-sulbactam (sultamicillin)
 - o amoxicillin/co-amoxicillin (co-amoxiclav)

cephalosporins

- first-generation cephalosporins
 - cefazolin
 - cefadroxil
- second-generation cephalosporins
 - cefuroxime
- third-generation cephalosporins
 - cefotaxime
 - ceftazidime
 - ceftriaxone
 - cefixime
 - cefoperazone/cefoperazone-sulbactam (sulperazone)
 - ceftazidime/ceftazidime-avibactam
- fourth-generation cephalosporins
 - cefepime
- fifth-generation cephalosporins
 - ceftaroline
 - ceftolozane-tazobactam

carbapenems

- meropenem
- imipenem-cilastatin
- ertapenem

monobactams

- aztreonam

glycopeptides

- vancomycin
- teicoplanin

lipoglycopeptides

- dalbavancin

polymyxins

- polymyxin B
- colistimethate

tetracyclines

- doxycycline
- tigecycline

aminoglycosides

- gentamicin
- amikacin
- kanamycin
- tobramycin
- neomycin

macrolides

- clarithromycin
- spiramycin
- azithromycin
- erythromycin

oxazolidinones

- linezolid

lincosamides

- clindamycin

amphenicols

- chloramphenicol

quinolones

- ciprofloxacin
- ofloxacin / levofloxacin
- norfloxacin
- prulifloxacin
- moxifloxacin

sulfonamides

- sulfadiazine
- sulfathiazole
- sulfamethoxazole/co-trimoxazole (trimethoprim)

nitroimidazoles

- metronidazole

nitrofurans

- nitrofurantoin
- nifuratel
- nifuroxazide

ansamycins

- rifampicin
- rifaximin
- fosfomicin

local antibiotics

- see outline Dermatologics

antituberculotics

- isoniazid
- rifampicin
- rifabutin
- ethambutol
- pyrazinamide
- capreomycin

- cycloserine

Learning outcomes

Student knows the basic pharmacological profile (mechanism of action, side effects, indications and contraindications) of individual classes of antibacterial drugs.

Student knows the basic pharmacological profile (mechanism of action, side effects, indications and contraindications) of antituberculotics.

Student knows the basic principles of rational antimicrobial therapy.

The student knows the important interactions of antibiotics with other drugs.

The student describes and explains the mechanisms of resistance of important microbial organisms to antibacterial drugs.

Study literature

Rang & Dale's Pharmacology 9th edition, 2020, chapters 51 and 52.
Study materials to subjects aVLFA0822c and aVLFA0822p.

Exam questions

Special pharmacology:

30. Principles of antibacterial therapy – overview (modes of action, resistance, MIC, MBC); 31., Penicillins, carbapenems; 32. Cephalosporines, monobactams; 33. Lincosamides, glycopeptides, polymyxins; 34. Tetracyclines + related ATBs, amphenicoles; 35. Macrolides and related ATBs; 36. Aminoglycosides; 37. Sulphonamides, nitrofurans and nitroimidazoles; 38. Quinolones, antituberculotics

“Essential” drugs:

76. phenoxymethylpenicilin, 77. co-amoxicilin, 78. piperacilin, 79. cefuroxim, 80. meropenem, 81. vancomycin, 82. doxycycline, 83. clarithromycin, 84. azithromycin, 85. gentamicin, 86. cotrimoxazol, 87. ciprofloxacin, 88. rifampicin

Title of the learning unit: Antifungals

Relevant terms

polyenes

- local
 - nystatin
 - natamycin
- systemic
 - amphotericin B

azoles

- local
 - clotrimazole
 - econazole
 - miconazole
- systemic
 - fluconazole
 - itraconazole
 - voriconazole
 - posaconazole

echinocandins

- caspofungin
- micafungin

allylamines

- terbinafine
- naftifin

ciclopirox

Learning outcomes

Student knows the basic pharmacological profile (mechanism of action, side effects, indications and contraindications) of individual classes of antifungal agents.

Student knows significant interactions of antifungal agents with other drugs.

Study literature

Rang & Dale's Pharmacology, 9th ed., 2020

Study materials in IS aVLFA0822c and aVLFA08222p.

Exam questions

Special pharmacology: 38. Antimycotics

“Essential” drugs: terbinafine; caspofungin; amphotericin B; fluconazole

Title of the learning unit: Antivirals

Relevant terms

antivirals

- local
- systemic

antiherpetics

- DNA polymerase inhibitors
 - **aciclovir** / **valaciclovir**
 - **ganciclovir** / **valganciclovir**

antiviral agents against influenza viruses

- uncoating inhibitors
 - amantadine
- neuraminidase inhibitors
 - **zanamivir**
 - **oseltamivir**

antiretrovirals

- reverse transcriptase inhibitors
 - nucleoside and nucleotide (NRTI)
 - zidovudine
 - emtricitabine
 - tenofovir
 - non-nucleoside (NNRTI)
 - efavirenz
- protease inhibitors
 - **ritonavir**
- entry inhibitors
 - fusion inhibitors- enfuvirtide
 - CCR5 receptor antagonists (entry inhibitors)- maraviroc
- integrase inhibitors
 - **raltegravir**
- multiple drugs – Highly Active Antiretroviral Therapy (HAART)

Respiratory infections

- RSV -palivizumab
- COVID-19 bamlanivimab
 remdesivir

viral hepatitis treatment

- HCV

- ribavirin
- HBV – viral polymerase inhibitors
 - adefovir

antiviral biological treatment

- interferons

Learning outcomes

Student knows the basic pharmacological profile (mechanism of action, side effects, indications and contraindications) of individual classes of antiviral drugs.

Student knows major interactions of antivirals with other drugs.

Study literature

Rang & Dale's Pharmacology, 9th ed., 2020

Study materials in IS aVLFA0822c and aVLFA08222p.

Exam questions

Special pharmacology: 40. Antivirals

"Essential" drugs: acyclovir; zidovudine

Learning unit: Dermatologics

Impact of the learning unit

Learning outcomes of the learning unit are to introduce the drug dosage forms most used in dermatology and the active substances from the group of antiseptics, disinfectants, emollients, astringents, antipsoriatics and drugs for acne therapy. Student will learn how to prescribe IPP of dermatological preparations and is able to avoid the major incompatibilities of components in prescription.

Relevant terms

antiseptics, disinfectants

- alcohols, aldehydes, phenols
 - ethanol
 - isopropanol
 - phenol
- acids
 - boric acid
 - salicylic acid
- oxidizing agents
 - hydrogen peroxide
 - potassium permanganate
 - iodine / iodine tincture / Lugol's solution
 - chlorine / chlorhexidine / hypochlorite
- surfactants
 - soaps
 - quaternary ammonium compounds
- organic dyes
 - gentian violet
- metals
 - silver
 - mercury

astringents

- tannins
- silver nitrate
- aluminium acetate and tartrate

keratolytics, keratoplastics

- salicylic acid
- urea
- tretinoin
- ichthammol
- tar (pix)

wound healing substances

- pantothenic acid / dexpanthenol
- balsam of Peru
- chlorophyll
- chamazulene
- hyaluronic acid
- propolis

emollients

- liquid paraffin
- white grease
- almond oil
- urea
- soybean oil
- fish oil

acne therapy

- retinoids
- antibiotics
- benzoyl peroxide

antipsoriatics

- tar
- ichtamol
- retinoids
- derivatives of vit. D
- psoralen / PUVA
- biologic treatment
 - etanercept
 - infliximab
 - adalimumab

topical ATBs

- neomycin + bacitracin
- fusidic acid
- mupirocin
- systemic antibiotics used topically (clindamycin, tetracycline, erythromycin, azithromycin, chloramphenicol, kanamycin, tobramycin, ofloxacin, sulfacetamide, metronidazole)

anti-inflammatory drugs

- glucocorticoids

urticaria

rosacea

Learning outcomes

Student knows the basic pharmacological profile (mechanism of action, side effects, indications and contraindications) of individual classes of dermatologics.

Study literature

Rang & Dale's Pharmacology, 9th ed., 2020

Study materials in IS aVLFA0822c and aVLFA08222p.

Exam questions

Special pharmacology: 39. Dermatologics – overview of classes, drugs and effects

"Essential" drugs: aciclovir; ciprofloxacin; cyclosporine; gentamicin; methotrexate; terbinafine

Learning unit: Antiemetics, prokinetics and antivertiginous drugs

Important terms

antiemetic drugs

- H₁ antihistamines
 - promethazine
 - moxastine
 - motion sickness
- 5-HT₃ antagonists (**setrons**)
 - ondansetron
 - granisetron
 - palonosetron
- NK₁ antagonists
 - aprepitant
 - netupitant
- D₂ antagonists
 - antipsychotics
 - thiethylperazine
 - haloperidol
 - olanzapine
- antimuscarinic drugs
 - scopolamine (hyoscine)
 - motion sickness
- other
 - cannabinoids
 - nabilone
 - ginger
 - dexamethasone

prokinetics

- D₂ receptor antagonists
 - domperidone
 - metoclopramide
- D₂ receptor antagonists + acetylcholinesterase inhibitors
 - itopride

antivertiginous drugs

- Ca channel blockers
 - cinnarizine, flunarizine
- betahistine

chemotherapy induced nausea and vomiting (CINV)

nausea in pregnancy

Learning outcomes

Student knows basic pharmacological profile (mechanism of action, adverse effects, indications, contraindications) of the particular groups of antiemetic drugs.

Student knows basic pharmacological profile (mechanism of action, adverse effects, indications, contraindications) of the particular groups of antivertiginous drugs.

Student can list substances, which can be used in nausea and vomit in pregnancy and in vomit induced by cytostatic drugs.

Student knows basic pharmacological profile (mode of action, unwanted effects, indications and contraindications) of prokinetics.

Recommended study materials

Rang & Dale's Pharmacology, Humphrey Rang 9th edition, 2020, chapter 31

Study materials of the course aVLFA0822c and aVLFA0822p.

Exam questions

Special pharmacology: 41. Antiemetic drugs, prokinetics, antivertigo drugs

"Essential" drugs: 8. aprepitant, 11. betahistin, 74. metoclopramide, 85. ondansetron

Learning unit: Laxatives, antidiarrhoeal drugs

Important terms

laxatives

- bulk-forming
 - roughage (psyllium)
- osmotic
 - lactulose
 - macrogol
 - sulfates
- emollients
 - docusate
 - glycerol
- stimulant
 - bisacodyl
 - sodium picosulfate
 - senna and anthraquinones
- laxatives for specific indications
 - naloxone
 - naloxegol
- tolerance and dependence on laxatives

antidiarrheal drugs

- adsorbents
 - diosmectite
 - activated charcoal
- antimotility agents
 - loperamide
 - diphenoxylate (+ atropine)
- intestinal antiseptic drugs
 - chloroxine
- other
 - racecadotril
- antibiotics
 - rifaximin
 - nifuroxazide
 - systemic ATBs
- other
 - probiotics
 - prebiotics
 - surface-active agents
 - simeticone
- combinations of antidiarrhoeal drugs

Learning outcomes

Student knows basic pharmacological profile (mechanism of action, adverse effects, indications, contraindications) of the particular groups of laxatives.

Student knows basic pharmacological profile (mechanism of action, adverse effects, indications, contraindications) of the particular groups of antidiarrhoeal drugs.

Student knows therapeutic process and substances used for treatment of infectious diarrhoea.

Recommended study materials

Rang & Dale's Pharmacology, Humphrey Rang 9th edition, 2020, chapter 31

Study materials of the course aVLFA0822c and aVLFA0822p.

Exam questions

Special pharmacology: 42. Laxatives, antidiarrheals, drugs of infectious diarrhoea

"Essential" drugs: 62. lactulose, 68. loperamide

Learning unit: Antiulcer drugs and other drugs used in GIT

Important terms

antiulcer drugs

- drugs decreasing production of HCl
 - inhibitors of proton pump
 - **omeprazole/esomeprazole**
 - **lansoprazole**
 - **pantoprazole**
 - H2 antihistamines
 - **ranitidine**
 - **famotidine**
- other substances
 - antacids
 - sodium bicarbonate
 - oxides and carbonates of magnesium and aluminium
 - cytoprotective agents
 - bismuth salts
 - sucralfate
 - eradication of *Helicobacter pylori*
 - combination of 2 ATBs + PPI
 - amoxicillin
 - clarithromycin
 - metronidazole

hepatoprotective agents

- ursodeoxycholic acid (UDCA)
- S-adenosyl methionine
- silymarin
- essential phospholipids
- B vitamins

cholagogues/choleretics

- UDCA
- obeticholic acid
- fenipentol
- essential oils (fennel, mint)

antiflatulent agents

- simeticone/dimeticone

substances for local administration in oral cavity

- antiseptic drugs used in oral cavity
 - chlorhexidine
 - povidone iodine
- local anaesthetics

- analgesics/anti-inflammatory drugs
 - choline salicylate
 - dexamethasone
- antifungal drugs
- substances with combined effect
 - benzydamine

drugs for treatment of non-specific inflammatory bowel diseases

- salicylates
 - sulfasalazine
 - mesalazine
- glucocorticoids
 - prednisone/prednisolone
 - budesonide
- monoclonal antibodies
 - TNF-alpha inhibitors
 - ustekinumab
 - vedolizumab
- immunosuppressants
 - methotrexate
 - cyclosporin A (ciclosporin)
 - azathioprine

Learning outcomes

Student knows basic pharmacological profile (mechanism of action, adverse effects, indications, contraindications) of the particular groups of antiulcer drugs and other drugs used in GIT.

Recommended study materials

Rang & Dale's Pharmacology, Humphrey Rang 9th edition, 2020, chapter 31

Study materials of the course aVLFA0822c and aVLFA0822p.

Exam questions

Special pharmacology: 43. Antiulcer agents, hepatoprotectives and drugs influencing the production and excretion of bile; 44. Drugs for treatment of nonspecific inflammatory bowel diseases

“Essential” drugs: 89. pantoprazole, 33. famotidine, 94. prednisone, 18. cyclosporine, 76. methotrexate

Learning unit: Cytostatics and targeted anticancer drugs

Important terms

anticancer drugs

- cytostatic agents
 - adverse effects of cytostatics and their pharmacological management
 - myelosuppression (bone marrow toxicity)
 - haemopoietic growth factors
 - nausea and vomiting
 - mucosal toxicity (mucositis, stomatitis, gastrointestinal ulceration)
 - cardiotoxicity
 - nephrotoxicity and urotoxicity
 - mesna
 - hydration and urinary alkalisation
 - diuretics
 - neurotoxicity
 - other side effects
 - classification of cytostatic agents according to their mechanisms of action
 - drugs with direct effects on the nucleic acid structure
 - alkylating agents
 - cyclophosphamide
 - melphalan
 - busulfan
 - temozolomide
 - nitrosourea derivatives
 - platinum compounds
 - **cisplatin**
 - **oxaliplatin**
 - **carboplatin**
 - intercalating agents
 - anthracyclines
 - **doxorubicin**
 - **epirubicin**
 - drugs influencing nucleic acid metabolism
 - antimetabolites
 - interfering with nucleic acid function
 - methotrexate
 - 6-mercaptopurine
 - 5-fluorouracil
 - other cytostatics interfering with metabolism
 - asparaginase
 - topoisomerase inhibitors
 - topoisomerase I inhibitors
 - **irinotecan**
 - topoisomerase II inhibitors
 - **etoposide**
 - drugs influencing microtubule assembly and function

- vinca alkaloids
 - **vinorelbine**
 - **vinblastine**
 - taxanes
 - **paclitaxel**
 - **docetaxel**
 - other agents
 - bleomycin
 - hydroxyurea (hydroxycarbamide)
- hormonal anticancer therapy
 - progestogens
 - antioestrogens
 - oestrogen receptor antagonists
 - fulvestrant
 - tissue selective dualists
 - **tamoxifen**
 - peripheral aromatase inhibitors
 - **anastrozole**
 - **letrozole**
 - exemestane
 - antiandrogens
 - androgen receptor antagonists
 - cyproterone acetate
 - **flutamide**
 - **bicalutamide**
 - GnRH antagonists/gonadoliberin analogs
 - **goserelin**
 - glucocorticoids
- targeted anticancer drugs
 - monoclonal antibodies (-mab) – including immune checkpoint inhibitors
 - tyrosine kinase inhibitors (-tinib)
 - representatives
 - anti-CD20
 - **rituximab**
 - anti-BCR-ABL
 - **imatinib**
 - anti-HER2
 - **trastuzumab**
 - anti-EGFR
 - **erlotinib**
 - anti-VEGF
 - **bevacizumab**
 - **sunitinib**
 - T-cells activity modulators
 - anti-PD-1
 - **nivolumab**
 - anti-CTLA-4
 - **ipilimumab**

complementary anticancer therapy (other pharmacological interventions)

- drugs used for the management of cancer pain
 - opioid analgesics
- psychotropic drugs in the therapy of cancer pain
 - tricyclic antidepressants
 - anticonvulsants
- bisphosphonates
 - zoledronate
 - ibandronate
 - clodronate
- denosumab

drugs used to decrease toxicity of anticancer drugs

- mesna
- leucovorin (calcium folinate)

specificity of cytostatics related to the cell cycle phases

pharmacotherapy of cancer diseases

- adjuvant, neoadjuvant pharmacotherapy
- curative / supportive therapy and palliative care
- induction / consolidation therapy

Learning outcomes

Student defines the cytostatic and chemotherapeutic agents.

Student knows basic pharmacological profile (mechanism of action, adverse effects, indications, contraindications) of the particular groups of anticancer drugs and other drugs used in oncology (e.g., drugs used to mitigate some side effects of cytostatic drugs).

Student gives examples of drugs decreasing toxicity of cytostatics and explain their mechanisms of action.

Recommended study materials

Rang & Dale's Pharmacology E – Book, Humphrey Rang, 9th edition, 2020 (chapter 57; additional text - chapter 37)

Study materials of the course aVLFA0822c and aVLFA0822p.

Exam questions

Special pharmacology: 45. Alkylating cytostatics and other drugs aiming on DNA in oncology; 46. Targeted treatment in oncology; 47. Antimetabolites + hormonal therapy in oncology

Essential drugs: 1. 5-fluorouracil, 16. cisplatin, 17. cyclophosphamide, 26. doxorubicin, 45. imatinib, 48. interferons, 76. methotrexate, 82. nivolumab, 88. paclitaxel, 104. tamoxifen, 108. trastuzumab

Learning unit: General principles of intoxication therapy

Impact of the learning unit:

Students will gain knowledge concerning the most frequent basic principles of intoxication therapy. The knowledge of decision tree for therapy of intoxication is in the frame of urgent medicine essential part of pharmacologic curriculum.

Important terms

Toxidroms

- cholinergic
- anticholinergic
- sympathomimetic
- opioid
- sedative/hypnotic
- hallucinogen
- serotonin

Therapy of intoxications

- prevention of further absorption/decontamination
 - gastric lavage
 - induction of vomiting
 - inactivation of toxins in GIT
 - activated charcoal
 - diosmectite
 - increased passage in GIT
 - sorbitol
- elimination of absorbed toxic substances and their metabolites
 - forced diuresis
 - mannitol
 - furosemide
 - extracorporeal elimination
 - haemodialysis
 - hemoperfusion
- specific therapy - antidotes
 - naloxone
 - N-acetylcysteine
 - flumazenil
 - protamine
 - spec. antidotes DOACs (xabans, gatrans)
 - globulinum antidoxinum
 - pralidoxime
 - physostigmine
 - atropine
 - ethanol
 - fomepizole
 - methylene blue
 - deferoxamine

Learning outcomes

Student knows the most frequent cases of intoxications and is able to suggest both specific and non-specific therapy.

Student knows specific antidotes of selected substances.

Recommended study materials

Rang & Dale's Pharmacology E - Book, Humphrey Rang 9th edition, 2020, not found within one chapter - it is necessary to extract from the whole special pharmacology.

Study materials of the course aVLFA0822c and aVLFA0822p

Exam questions

Special pharmacology: 61. General principles of drug poisoning, specific antidotes and their mechanisms of action

“Essential” drugs: atropine, furosemide, acetylcysteine, naloxone

Learning unit: Drug interactions

Impact of the learning unit:

The learning unit gives an overview of the basic types of drug-drug interactions and classifies interactions with respect to their mechanism (pharmacokinetics, pharmacodynamics, pharmaceutical), respect to the final effect (antagonistic, synergistic), or respect to their severity.

Important terms

drug-drug interactions

- pharmaceutical
- pharmacokinetic
 - on the level of
 - absorption
 - distribution
 - metabolism
 - excretion
- pharmacodynamic

polypharmacy

desired interaction - use

- antagonism
 - antidotes
- summation
- potentiation
- examples
 - antibiotics
 - antihypertensives
 - anticancer treatment

unwanted interaction

- drugs affecting CYP activity
- inhibitors of PgP
- influence of meal on drug effect
- food supplements

evaluation of drug-drug interaction

proposed solution of drug-drug interaction

Learning outcomes

Student explains: drug tolerance, tachyphylaxis, allergy, upregulation, downregulation, internalization of receptors.

Student recognizes drug-drug interaction, describes its severity, and classifies the type of interaction.

Student is oriented in the information sources and recognizes relevant ones.

Student proposes solution of drug-drug interaction and knows suitable alternative drug combination.

Recommended study materials

Rang & Dale's Pharmacology, 9th edition, 2020

Study materials of the course aVLFA0822c and aVLFA0822p.

https://www.drugs.com/drug_interactions.html

<https://www.medicinescomplete.com/mc/alerts/current/drug-interactions.htm>

<https://reference.medscape.com/drug-interactionchecker>

Exam questions

General pharmacology: 27. Drugs interactions - overview, examples

Learning unit: Phytopharmacology

Important terms

pharmacognosy

natural drugs

active substances

- primary metabolites
- secondary metabolites
- examples of active substances with pharmacological effects
 - mucilages
 - alkaloids (tropane alkaloids, ergot alkaloids, opium alkaloids, vinca alkaloids)
 - flavonoids
 - tannins
 - bitter principles
 - essential oils
 - saponins
 - cardioactive glycosides
- examples of drugs of natural origin or their semisynthetic derivatives

types of herbal preparations

- herbal medicinal products
 - marketing authorisation process
- food supplements
 - market launch process

examples of medicinal herbs and their reasonable use

- hypnosedatives, anxiolytic agents
 - valerian – essential oils, valepotriates (*Valeriana officinalis*)
 - passion flower – flavonoids, indole alkaloids (*Passiflora incarnata*)
 - hop – essential oils, flavonoids (*Humulus lupulus*)
- muscle relaxants
 - cannabis extract – THC, cannabidiol (*Cannabis sativa*)
- laxatives
 - bulk-forming – fibre (psyllium, *Plantago ovata*)
 - stimulant – anthraquinones (*Cassia senna*)
- drugs used in GIT disorders
 - cholagogues – essential oils (fennel – *Foeniculum vulgare*, mint – *Mentha piperita*)
 - GIT spasmolytics – essential oils (chamomile – *Matricaria chamomilla*, mint – *Mentha piperita*)
- antiemetics
 - ginger – essential oils (*Zingiber officinale*)
- antitussive and mucoactive drugs
 - marshmallow – mucilages (*Althaea officinalis*)
 - liquorice – saponins (*Glycyrrhiza glabra*)
- dermatologics
 - astringents – tannins (witch hazel, *Hamamelis sp.*)
 - wound healing substances – propolis (honey bee product), chamomile (*Matricaria chamomilla*)
 - emollients – plant oils

examples of poisonous plants and mushrooms

- belladonna (*Atropa belladonna*)
- lilly-of-the-valley (*Convallaria majalis*)
- yew (*Taxus* sp.)
- herb-paris (*Paris quadrifolia*)
- foxglove (*Digitalis* sp.)
- castor oil plant (*Ricinus communis*)
- mezereum (*Daphne mezereum*)
- periwinkle (*Vinca minor*)
- death cap (*Amanita phalloides*)
- panther cap (*Amanita pantherina*)

algorithm of poisoning treatment

- see the learning unit JS13 General principles of intoxication therapy
- Toxicology information center

Learning outcomes

Student estimates potential use of a medicinal herb based on its main active substance. Student identifies reliable sources of information about herbal medicines and medicinal herbs. Student can advise on the use of medicinal herbs in selected non-serious diseases. Student explains potential risks of self-treatment with plants and knows the most important poisonous plants and mushrooms.

Recommended literature

Rang & Dale's Pharmacology, 9th edition, 2020

Study materials in the IS for courses aVLFA0721p, aVLFA0721c, aVLFA0822p and aVLFA0822c

Exam questions

Drugs of natural origin are incorporated in other learning units from special pharmacology.

Title of the learning unit: Drug treatment of Erectile Dysfunction and BPH

Impact of the learning unit

Erectile dysfunction is closely related to cardiovascular complications and increased risk of IM. Moreover, the range of drugs used in these indications may exacerbate erectile dysfunction. Medical students should know the basic drugs used in erectile dysfunction therapy.

Benign prostatic hyperplasia is the most common benign tumor in elderly men. Appropriately chosen pharmacotherapy can significantly reduce the incidence of disease symptoms and increase the life quality of the patient.

Relevant terms

erectile dysfunction drugs

- phosphodiesterase 5 inhibitors (oral use)
 - drugs with short half-life
 - **sildenafil**
 - **vardena**fi**l**
 - drugs with long half-life
 - **avana**fi**l**
 - **tada**la**fi**l****
- intracavernous administration of prostaglandin e1 (autoinjector method of administration)
 - **alprostadi**l****

drugs of benign prostatic hyperplasia

- 5- α -reductase inhibitors (antiandrogens)
 - **finasteride**
 - **dutasteride**
- α_1 – sympatholytics
 - **tamsulosin**
 - **alfuzosin**
- phosphodiesterase 5 inhibitors
 - **tadalaf**il****

Learning outcomes

Student knows the basic pharmacological profile (mechanism of action, adverse effects, indications and contraindications) of the mentioned drugs.

Study literature

Rang & Dale's Pharmacology, 9th edition, 2020

Study materials to subjects aVLFA0822c and aVLFA0822p.

Exam questions

Special pharmacology: 62. Drugs used in erectile dysfunction and BHP

"Essential" drugs: sildenafil, finasteride

Title of the learning unit: Vitamins

Impact of the learning unit

The aim of the learning unit is to provide the general classification of vitamins, their function in the human body, manifestation of deficiency and the possibility of therapeutic use.

Description of the learning unit

Vitamins are low molecular weight compounds that contribute to the proper function of the organism. Vitamin deficiency (hypovitaminosis) leads to defined symptoms, which are reversible by vitamin supplementation. Long-term lack of multiple vitamins (avitaminosis) leads to a life-threatening condition. Conversely, overdose of some vitamins (hypervitaminosis) leads to toxicity. In addition to supplementation, some vitamins have therapeutic utility, e.g. in dermatology, to prevent methotrexate toxicity, as an antidote to warfarin, or to affect bone metabolism.

Relevant terms

water soluble vitamins

- B vitamins
 - vitamin B1 (thiamine)
 - vitamin B2 (riboflavin)
 - vitamin B3 (niacin)
 - vitamin B5 (pantothenic acid)
 - vitamin B6 (pyridoxine, pyridoxal, pyridoxamine)
 - vitamin B7 (biotin)
 - vitamin B9 (folic acid)
 - vitamin B12 (cobalamin)
- vitamin C (ascorbic acid)

fat soluble vitamins

- vitamin A (retinol)
- vitamin D
 - vitamin D2 (ergocalciferol)
 - vitamin D3 (cholecalciferol/ calcitriol)
- vitamin E (tocopherol)
- vitamin K (phylloquinone, menaquinone)

drugs derived from vitamins

- retinoids
 - tretionin
 - adapalen
 - see learning unit Dermatology
- vitamin D derivatives
 - calcipotriol
 - takalcitol
- leukovorin (folinic acid)
 - see learning unit Cytostatics
- pyritinol
 - see learning unit Nootropics

hypovitaminosis

hypervitaminosis

interaction of vitamins and drugs

Learning outcomes

Student is able to classify vitamins according to their solubility, knows their function in human body and manifestation of hypovitaminosis.

Student knows examples of therapeutic use of particular vitamins and drugs derived from vitamins.

Student knows the specific increased need for vitamins in individual population groups.

Study literature

Rang & Dale's Pharmacology, 9th edition, 2020

Study materials to subjects aVLFA0822c and aVLFA0822p.

Exam questions

Special pharmacology: 63. Vitamins AEDK, hydrophilic vitamins

Learning unit: Antiglucomatics and cycloplegics

Impact of the learning unit

The aim is to provide students with a basic overview of antiglaucoma and mydriatic agents used in ophthalmology. During the course, students will learn about the mechanisms of action of the most common antiglaucoma agents, their therapeutic application and side effects. Special attention will be paid to the pharmaceutical forms of ophthalmic medicinal products and the most frequent combinations of antiglaucoma drugs used in ophthalmology. Antiglucoma drugs prevent damage to the optic nerve by reducing intraocular pressure. Acute glaucoma attack requires urgent treatment. Mydriatics are used in ophthalmology for both diagnosis and therapy of ocular diseases, e.g. for prevention of synechiae in eye surgery. Anticholinergic drugs induce cycloplegia along with mydriasis.

Important terms

antiglucoma drugs reducing production of aqueous humour

- carbonic anhydrase inhibitors
 - brinzolamide (local administration)
 - dorzolamide (local administration)
 - acetazolamide (systemic - orally)
- beta adrenergic receptor blockers
 - timolol (*non-selective without ISA*)
 - betaxolol (*beta 1 selective without ISA*)
 - carteolol (*non-selective with ISA*)
- selective and non-selective sympathomimetics
 - alpha 2 adrenergic agonists
 - brimonidine
 - adrenaline (IPP eye drops, therapy of neovascular glaucoma)

antiglucoma drugs increasing uveoscleral outflow

- direct parasympathomimetics (miotics)
 - pilocarpine
 - carbachol (*miosis during ocular surgery*)
- indirect parasympathomimetics (miotics)
 - physostigmine
 - miosis before intraocular surgery
 - (*earlier also therapy of open-angle glaucoma*)
- alpha 2 selective sympathomimetics
 - brimonidine
- prostaglandin F2 alpha analogues
 - latanoprost
 - travoprost
 -

hyperosmotic antiglucoma drugs

- mannitol (i.v. in eye surgery)
- glycerol (p.o.)
 - (*not used in chronic therapy of glaucoma*)

mydriatics

- anticholinergics (mydriatic and cycloplegic effects)
 - therapeutic mydriatic drugs (long term, prevention of synechiae)
 - atropine
 - hyoscine (scopolamine) (IPP)
 - diagnostic mydriatics (short term, examination of the fundus)
 - tropicamide
 - cyclopentolate
 - homatropine (IPP)
- sympathomimetics
 - tetryzoline
 - phenylephrine

Learning outcomes

Student knows basic pharmacological profile (mechanism of action, adverse effects, drug administration routes, other indications) of the particular groups of drugs used in the treatment of glaucoma.

Student knows basic pharmacological profile (mechanism of action, adverse effects, drug administration routes, other indications) of mydriatic agents.

Student explains the term cycloplegic agent.

Recommended study materials

Rang & Dale's Pharmacology, 9th edition, 2020.

Study materials of the course aVLFA0721p, VLFA0721c, aVLFA0822p and aVLFA0822c.

Chapter 17.4 "Anti-glaucoma and miotic drugs" and 17.5 „Mydriatics and cycloplegics“ in the textbook "Pharmacology for students of bachelor's programmes at LF MU" (pp. 266-269), in IS aVLFA0822c.

Exam questions

Special pharmacology: 64. Antiglaucomatics and cycloplegics

Detail: atropine, noradrenaline, oxymetazoline, pilocarpine