

„Pharmacology and Toxicology“

1. Compulsory attendance:

Practical course „Pharmacology and Toxicology“, 6. Sem., Wed 9.15-10.45 + Fri 10.15-11.45

2. Accompanying Lecture:

Lecture „Pharmacology and Toxicology“, 5. + 6. Sem., Tue-Thu 8.15-9.00

3. Record of achievement:

Written exam at end of 6th semester

4. Educational objectives

in the field of „Pharmacology and Toxicology“,

1. General Pharmacology and Toxicology

1.1 Pharmacodynamics

- Drug effects [(non-)receptor-mediated, reversible and irreversible]
- Signal transduction pathways of membrane-associated and intracellular receptors
- Dose(concentration)-response relationships (maximum effect, potency, receptor reserve)
- Agonists, partial agonists, inverse agonists
- Antagonists (reversible, irreversible, competitive, non competitive)
- Plasmaconcentration –response relationships, hysteresis
- Pharmacodynamic interactions
 - disease-related interactions
 - drug-drug interactions
- Pharmacodynamic tolerance and sensitisation
- Drug addiction

1.2 Pharmacokinetics

- Absorption (mechanisms; role of physicochemical properties)
- Distribution (mechanisms; role of physicochemical properties)
- Elimination
 - Elimination via excretion (renal, biliary, enteral etc.)
 - Elimination via biotransformation (hepatic, enteral etc.)
 - Phase-I- and Phase-II-metabolisms
 - Pharmacogenetics
- Pharmacokinetic parameters
 - Bioavailability
 - Half-life
 - Clearance (total, renal, extrarenal clearance)
 - Volume of distribution
 - One- and two compartment models
- Accumulation
- Initial dose and maintenance dose
- Linear and non-linear kinetics
- Relation of drug effects with time and duration of effect
- Pharmacokinetic interactions
 - disease-related interactions
 - drug-drug interactions
- Pharmacokinetic tolerance

1.3 General Toxicology

- Scope of toxicology
 - Drug toxicology
 - Occupational toxicology
 - Food toxicology
 - Ecotoxicology
 - Environmental toxicology
- Exposure and dose-response
 - acute, chronic
 - local, systemic
 - site of absorption (metabolic activation/detoxication)
 - Dose-response relationships
- Quality of toxic response
 - acute toxicity
 - chronic toxicity
 - reproductive toxicity, teratogenicity, embryotoxicity
 - carcinogenicity
 - immunotoxicity
- Principles of risk assessment and evaluation
 - Toxicity testing (acute, subacute, subchronic, chronic)
 - Toxicokinetics and biotransformation
 - Mutagenicity testing
 - Carcinogenicity testing
 - Reproductive toxicity (fertility, teratogenicity)
 - Biomonitoring
 - Concepts in risk assessment and exposure limits (ADI, MAK, BAT, TRK)

1.4 Drug-Development

- Development
- Approval and monitoring

1.5 Dogmatic trends in drug therapy

- Phytotherapy
- Homoeopathy
- Anthroposophic therapy

2. Special Pharmacology and Toxicology

(for all sections the following aspects apply: drugs, mechanism of action, therapeutic effect, side effects, drug interactions, indication, contraindications, pharmacokinetics)

2.1 Pharmacology of the autonomic nervous system

- 2.1.1 Noradrenergic transmission, adrenergic transmission
- 2.1.2 Cholinergic transmission

2.2 Pharmacology of the central nervous system

- 2.2.1 Chemical transmitters and drug actions in the CNS
- 2.2.2 Amino acid transmitters
- 2.2.3 General anesthetic agents
- 2.2.4 Anxiolytic and hypnotic drugs
- 2.2.5 Antiepileptic drugs
- 2.2.6 Neurodegenerative diseases, Parkinson's disease, Alzheimer's disease
- 2.2.7 Antipsychotika (Neuroleptika)
- 2.2.8 Antidepressant drugs

- 2.2.9 Antipsychotic drugs
- 2.2.10 Drug addiction, dependence and abuse

2.3 Pharmacology of histamine

2.4 Pharmacology of serotonin/5-hydroxytryptamine (5-HT)

2.5 Pharmacology of analgesic and anti-inflammatory drugs

- 2.5.1 Opiates as analgesic drugs
- 2.5.2 NSAID
- 2.5.3 Other analgesic drugs

2.6 Pharmacology of the uric acid metabolism

2.7 Pharmacology of Ion-channels

- 2.7.1 Local anesthetics
- 2.7.2 Anti arrhythmic drugs
- 2.7.3 Pharmacology of potassium Channels
- 2.7.4 Pharmacology of Ca⁺⁺-Channels

2.8 Pharmacology of (positive) inotropic substances

- 2.8.1 Inhibitors of Na⁺, K⁺-ATPase (glycosides)
- 2.8.2 Sympathomimetic substances
- 2.8.3 Inhibitors of type III-phosphodiesterases

2.9 Pharmacology of vasodilatory acting substances

- 2.9.1 Nitrates
- 2.9.2 Inhibitors of type V-phosphodiesterases
- 2.9.3 ACE-inhibitors and AT1-receptor blockers
- 2.9.4 Vasodilatory substances targeting ion channels
- 2.9.5 Hydralazine and dihydralazine

2.10 Pharmacology of the respiratory system

- 2.10.1 Bronchodilators
- 2.10.2 Drugs with anti-inflammatory action

2.11 Pharmacology of diuretics

- 2.11.1 Benzothiadiazines
- 2.11.2 Loop-diuretics
- 2.11.3 Potassium-saving diuretics
- 2.11.4 Carboanhydrase inhibitors
- 2.11.5 Osmotic acting diuretics

2.12 Pharmacology of the haemopoietic system

- 2.12.1 Haematinic agents
- 2.12.2 Haemopoietic growth factors

2.13 Pharmacology of antithrombotic agents

- 2.13.1 Platelet-inhibitors
- 2.13.2 Anticoagulants
- 2.13.3 Fibrinolytics (thrombolytics)
- 2.13.4 Antifibrinolytics

2.14 Pharmacology of the gastrointestinal tract

- 2.14.1 Drugs that increase gastrointestinal motility
- 2.14.2 Drugs to control gastric secretion
- 2.14.3 Anti-inflammatory drugs for treatment of chronic inflammations of the gastric tract
- 2.14.4 Laxatives
- 2.14.5 Antidiarrhoeal drugs
- 2.14.6 Antiemetic drugs

2.15 Pharmacology of lipids

- 2.15.1 Inhibitors of hydroxymethylglutaryl-CoA-reductase
- 2.15.2 Fibrates
- 2.15.3 Nicotinic acid
- 2.15.4 Anion exchange resins
- 2.15.5 Inhibitors of cholesterol-resorption

2.16 Pharmacology of the endocrine pancreas and the control of blood glucose

- 2.16.1 Insulin
- 2.16.2 Oral anti-diabetic drugs

2.17 Pharmacology of Hormonal Systems (Endocrine Pharmacology)

- 2.17.1 Pharmacology of the thyroid gland
- 2.17.2 Pharmacology of the adrenal cortex
- 2.17.3 Gonadal pharmacology

2.18 Pharmacology of mineral homeostasis and bone metabolism

- 2.18.1 Calcium
- 2.18.2 Vitamin D and its derivatives
- 2.18.3 Inhibitors of bone resorption
- 2.18.4 Drugs with stimulatory effect on bone growth

2.19 Pharmacology of antimicrobial drugs

- 2.19.1 Inhibitors of cell wall synthesis
- 2.19.2 Inhibitors of protein synthesis
- 2.19.3 Antimicrobial drugs acting on DNA
- 2.19.4 Folic acid antagonists
- 2.19.5 Antimycobacterial drugs

2.20 Pharmacology of antimycotics

- 2.20.1 Inhibitors of fungal membrane stability and synthesis
- 2.20.2 Inhibitors of fungal wall synthesis
- 2.20.3 Inhibitors of fungal nucleic acid synthesis

2.21 Pharmacology of antivirals

- 2.21.1 Inhibition of viral attachment and entry
- 2.21.2 Inhibition of viral uncoating
- 2.21.3 Inhibition of viral genome replication
- 2.21.4 Inhibition of viral proteases
- 2.21.5 Inhibition of viral release
- 2.21.6 Highly active antiretroviral therapy (HAART)

2.22 Pharmacology of substances acting against protozoa and helminths

- 2.22.1 Antiprotozoal agents
- 2.22.2 Anthelmintic agents

2.23 Pharmacology of anticancer drugs

- 2.23.1 Antimetabolites
- 2.23.2 Alkylating agents
- 2.23.3 Topoisomerase inhibitors
- 2.23.4 Mikrotubuli-Inhibitors
- 2.23.5 Antibiotics
- 2.23.6 Hormones and antagonists
- 2.23.7 Novel anticancer drugs

2.24 Pharmacology of drugs used to modulate the immune response

- 2.24.1 Mechanisms of immune response
- 2.24.2 Immunosuppressants
- 2.24.3 Immunostimulants
- 2.24.4 Mediators of the immune system and their antagonists
- 2.24.5 Basic therapy of rheumatic diseases

2.25 Special toxicology

- 2.25.1 Chemical carcinogens
- 2.25.2 Toxic gases
- 2.25.3 Toxicology of solvents and vapors
- 2.25.4 Toxicology of pesticides
- 2.25.5 Toxicology of metals
- 2.25.6 Toxicology of naturally occurring compounds
- 2.25.7 Problem areas in toxicology