

# **Pathological physiology I**

## **Detailed syllabus**

### **General medicine**

**Department of Pathophysiology, Faculty of Medicine in Pilsen, Charles University**

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The subject Pathological Physiology I forms one unit with the follow-up subject Pathological Physiology II. Individual topics can be moved between the courses Pathological Physiology I and II.

## **General pathophysiology I**

### **Introduction to the subject**

Definition of the content of the subject, sections of the subject, relations to other subjects of the medical study, methods of pathophysiology as a science

History of pathophysiology

Definition of basic terms, definition of the terms health and disease

Etiology, the main views on the etiology of diseases

Iatrogenic, idiopathic, multifactorial diseases

Pathogenesis

General pathogenetic mechanisms, models of pathological states

Role of physiological regulatory mechanisms in the pathogenesis of diseases

Physiological and pathological parameters and phenomena, normal state versus pathology

### **Disease and its course**

Disease, pathological state, nosological unit, symptom, objective and subjective manifestations of diseases, syndrome

Stages of a disease, forms of disease course, outcomes of a disease

Prognosis of diseases

### **Etiological factors**

Classification of etiological factors

Etiological versus risk factors

Influenceable and uninfluenceable etiological factors

Intrinsic etiological factors

- Definition, explanation of term inborn and hereditary (disease, disorder)

- Age, sex, circadian rhythmicity, congenital factors as etiological and risk factors of diseases - their basis, mechanisms of their role in disease development, examples of diseases

- Epigenetics – definition, mechanisms, sensitive periods, examples of diseases with epigenetic basis or participation

- Heredity

- Basic terms

- Types of mutations, types and mechanisms of mutation effects

- Types of heredity, their basis and principles, mechanisms of relation between alleles

- Examples of hereditary diseases

Extrinsic etiological factors

- Physical factors
  - Mechanical influences
    - Injuries, types of wound and their characters and specific features, wound healing and its disturbances, pathophysiological aspects of wound treatment, traumatic shock and its provoking factors and mechanisms of its development
  - Pressure of the environment (e.g. atmosphere) and its changes
    - Acute and chronic adaptations on the higher altitude
    - Altitude disease, barotrauma, decompression illness – causes, pathogenesis, manifestations and consequences, prevention
    - Hyperbaric oxygenotherapy – principles, application, mechanisms of its effects, risks
  - Noise, infrasound, ultrasound
  - Kinetosis
  - Electric current
    - Direct and alternating current, tissue as a part of an electric circuitry, biological effects of direct and alternating electric current, mechanisms of effect, comparison of effects and their level in direct and alternating electric current, electric current injuries, factors influencing character and intensity of the organism affection, principles of safety
  - Thermic influences
    - General and local (including general response of the organism) impact of cold and heat - burns (degrees – their characteristics and consequences, the second burn shock), frostbites (degrees – their characteristics and consequences), trench-foot syndrome, hypothermia, insolation, hyperthermia
  - Radiation – ionizing and non-ionizing
    - Classification of radiation, effects of different kinds of radiation on the organism and its mechanisms, radiation illness
- Chemical factors
  - Toxins
    - Ways of entrance, mechanisms of effects, toxicity quantification, elimination of toxins, manifestation of intoxication
    - Examples of important toxic substances and their effects (heavy metals, arsenic, cyanides, carbon monoxide, nitric and nitrous compounds, organophosphates, curare and its derivatives, opiates, barbiturates, anticoagulants, main plant and animal poisons)
  - Corrosive substances and their effect
  - Teratogenic, mutagenic and cancerogenic substances
    - Mechanisms and consequences of their influence, examples
- Free radicals – their extrinsic and intrinsic sources, examples of free radicals, mechanisms of their action, consequences,
- Biological factors
  - Animals, plants, fungi – negative (toxicity, injuries, source of infections) and positive effects on human health
  - Infections
    - Classification (prions, viruses, bacteria, molds, protozoa, multicellular parasites – worms, mites, insects), characteristics of individual groups of infectious agents
    - Transfer mechanisms of infections and penetration of infectious agents into the organism, mechanisms of pathological effect of microorganisms and multicellular parasites
    - Factors determining sensitivity and resistance to infectious diseases
    - Examples of infectious diseases
    - Coexistence of human organism with microorganisms, examples of positive influence of microorganisms on the human (e.g. enteric microbioma)
- Social factors – examples, mechanisms of effects

Mutual influences and interactions of etiological factors

### **Developmental disorders**

Stages of the ontogenetic development

Altricial and precocious types of the development

Factors determining the individual's development and its disorders

Mechanisms of developmental disorders

Critical developmental periods

Diseases and disorders linked to a certain age, changes of the reactivity and resistance dependent on age

Gametopathy, blastopathy, embryopathy, fetopathy, perinatal damage – causes, mechanisms, character of the disorders, examples

Teratogenic factors and effects

Normal and impaired CNS development and factors that affect it, brain growth spurt

### **Growth disorders**

Nanism, gigantism, proportional and disproportional growth disorders

Causes and mechanisms of growth disorders

Influence of nutrition and the environment

Hereditary growth disorders

Growth disturbances of the endocrine origin

### **Aging**

Basic concepts (gerontology, geriatrics, demographic aging, maximum life span, average life span, life expectancy)

Causes and mechanisms of aging, theory of aging

Manifestations of aging, changes in the ageing organism

Social and health aspects of aging, age-related illness, specifics of therapy in aged patients

Abnormal course of aging, diseases with accelerated ageing

Factor influencing the course of aging

### **Terminal states, death**

Definition of death, clinical and biological death

Thanatology

Cell death and its mechanisms and causes, tissue death, death of an individual, brain death

Signs of death, determining the death of an individual

Causes and mechanisms of death

Philosophical, ethical, psychological, social aspects of death, euthanasia, dysthanasia

Dying and its stages

Lazarus syndrome

Persistent vegetative state, locked-in syndrome

### **Pathophysiology of immunity**

Immunity mechanisms and their classification

Classification of disorders and diseases of the immune system

Immunodeficiency

- Causes, pathogenesis, symptoms and consequences, characteristics and examples of disorders of individual components of the immune system

- Examples of congenital and acquired immunodeficiencies, their causes, pathogenesis and manifestations

## Allergy

- Causes of allergic diseases
- Allergization, cross- allergy
- Types of allergic reaction, their mechanisms, manifestations, consequences
- Anaphylaxis, anaphylactic shock
- Examples of illnesses

## Autoimmune diseases

- Causes, pathogenesis, symptoms and consequences
- Examples of autoimmune diseases, their pathogenesis, manifestation and consequences

## Inflammation

- Definition of inflammation
- Components of inflammatory reaction, course of inflammation
- Localized and systemic inflammatory manifestations and mechanisms of their origin
- The importance of inflammation for the organism
- Acute and chronic inflammation
- Inflammation as a pathogenic agent
- Inflammation suppression
- Systemic inflammatory response - definition, course and symptoms, causes, mechanisms

## Sepsis, septicemia, bacteremia

## Transplantation

- Definition, purpose and types of transplantation
- Transplantation immunology, host-versus-graft reaction, graft-versus-host reaction
- Transplant rejection
- Types of transplant rejection, their course and mechanisms
- Prevention of transplant rejection

## **Pathophysiology of thermoregulation, fever**

### Control and mechanisms of thermoregulation

Terminology of body temperature changes, limit values of body temperature in relation of changes in the organism and its functions

Overheating (hyperthermia) and hypothermia of the organism, their causes, manifestations and consequences

### Fever

- Definition, types of fever and its course
- Causes and mechanisms of fever
- The importance of fever for the organism
- Fever accompanying changes in the organism
- The risks and complications of fever

Febrile seizures – definition, occurrence, course, consequences, prevention, therapeutic approaches

Malignant hyperthermia – definition, causes and occurrence, inducing factors, pathogenesis, consequences, therapy principles

Controlled hypothermia - definition, principle, application, advantages, disadvantages, risks

## **Pathophysiology of tumors**

### Definition of tumors

### Epidemiology of tumors

### Classification of tumors

Malignant and benign tumors, their characteristics, biological and clinical malignancy of tumors

Causes and mechanisms of tumor formation

- Tumorigenesis, carcinogenic factors, protooncogenes, oncogenes, tumor suppressor genes
- Chemical and physical carcinogens, infectious etiology of tumors, tumor inheritance, role of immunity, endocrine factors
- Immunology of tumors

Tumor metabolism

Local and systemic effects of tumors on the organism

Expansive and invasive tumor growth

Tumor metastasis - ways and consequences

Paraneoplastic phenomena - definition, mechanisms, examples

Tumor markers

Principles of tumor therapy and prevention

## **Special pathophysiology I**

### **Pathophysiology of the lymphatic system**

- Importance and disorders of the lymphatic system
- Lymphedema – causes, consequences and manifestations

### **Pathophysiology of the blood**

Changes of blood volume and composition

- Normo-, hypo- a hypervolemia normocytic, oligocytic and hypercyclic
- Causes, pathogenesis, manifestation and consequences

Changes of blood plasma composition

- Disorders of protein spectrum, changes of organic and anorganic substances, their causes, pathogenesis and consequences

Pathophysiology of erythrocytes

- Factors determining amount and concentration of erythrocytes in the blood
- Anemias
  - Definition of anemia, laboratory indicators of anemia
  - Anemic syndrome
  - Classification of anemias
    - Normocytic, microcytic, macrocytic; normochromic, hypochromic
    - Etiopathogenetic classification of anemias
      - Anemias caused by insufficient RBC production
      - Anemias caused by increased loss of RBC
        - Anemia caused by acute and chronic bleeding
        - Hemolytic anemias corpuscular and extracorporeal
  - Characteristics, etiology, pathogenesis and manifestations of individual types of anemias
  - List of diseases involved in individual types of anemias and their pathophysiology
- Disorders of erythrocytes
  - Hereditary defects of erythrocytes (hemoglobinopathies, enzymatic defects, membrane defects, cytoskeleton defects)
  - Intoxications with change of hemoglobin properties
- Polycythemia, polyglobulia – definition of the terms, etiology, pathogenesis, manifestations and consequences
- Intravascular and extravascular hemolysis - causes, mechanisms, consequences
- Acute and chronic bleeding – causes, impact on blood composition, response of the organism

- Blood groups, transfusion and its risks, incompatibility, fetal erythroblastosis, their pathogenesis and consequences

#### Pathophysiology of leukocytes

- Classification and function of leukocytes
- Leukocyte function disorders, congenital and acquired leukocyte-related immune deficiencies
- Changes of leukocyte number (total and individual types of leukocytes), leukocytosis, leukopenia – causes, consequences
- Leukemias, lymphomas – classification, etiology, pathogenesis, manifestation, impacts on the organism

#### Hemorrhagic diathesis

- Definition, classification
- Inborn and acquired hemorrhagic diathesis: Bleeding related to platelets (thrombocytopenia, thrombocytopathies), coagulopathies (including pharmacologically induced), vasculopathies
  - causes, pathogenesis, manifestations, pathophysiology of particular diseases
- Pharmacologically induced changes of hemostasis – groups of medicaments, examples of medicaments, mechanisms and impacts of their effects, risks, manifestations and consequences of overdosing, possibilities of hemostasis correction in overdosed patients, patients in which use of these medicaments should be expected

Thrombotic states – definition, causes and risk factors, pathogenesis, manifestations and consequences, pathophysiology of the thromboembolic disease

Disseminated intravascular coagulation – definition, causes and inducing factors, pathogenesis, manifestations and consequences

### **Pathophysiology of the cardiovascular system**

General mechanisms of blood circulation disturbances and their consequences

#### Inborn heart defects

- Risk and etiologic factors of inborn heart defects
- Classification, division and characteristics of inborn heart defects
- Cyanotic, non-cyanotic, late cyanotic defects
- Hemodynamic consequences, manifestations and complications of individual heart defects, secondary changes and reactions of the organism as consequences of inborn heart defects

#### Acquired heart defects

- Etiology and risk factors, mechanisms of acquired heart defect development
- Classification and overview of acquired heart defects, orifice stenosis, valvular insufficiency, characteristics of individual defects
- Manifestations, hemodynamic consequences, secondary changes induced by acquired heart defects

Endocarditis, myocarditis, pericarditis – etiology, risk factors, consequences

#### Disturbances of peripheral blood circulation

- Factors influencing blood perfusion of the tissues under physiological and pathological conditions
- Angiopathy, vasculitis – causes, consequences, examples of diseases
- Ischemia
  - Causes, mechanisms of origin, consequences and manifestations
  - Ischemia-reperfusion injury
- Passive and active hyperemia - causes, mechanisms, consequences and manifestations

#### Atherosclerosis

- Pathological-anatomical description, stable and unstable atherosclerotic plaques
- Etiology and risk factors, prevention
- Pathogenesis of atherosclerosis

- Consequences, examples of diseases connected with atherosclerosis (ischemic heart disease, ischemic disease of the lower extremities, brain ischemia etc.)

Endothelial dysfunction – causes, pathogenesis, consequences

Ischemic heart disease (IHD)

- Definition, classification (forms of IHD), diagnostics
- Causes, risk factors, pathogenesis
- Specifics of coronary circulation, mechanisms of subendocardial and subepicardial ischemia
- Myocardial infarction
  - Pathogenesis, manifestation, types, consequences
  - Acute and chronic complications of the myocardial infarction and their pathogenesis
  - Zones of different affection of the myocardium, factors determining myocardial affection extent
- Angina pectoris stable and unstable, Prinzmetal (variant) type – pathogenesis, manifestations
- Arrhythmic form of the ischemic heart disease
- Sudden death

Arrhythmias

- Classification, characteristics of individual arrhythmias, causes and mechanisms of origin, reentry phenomenon, R-on-T phenomenon, hemodynamic consequences of particular arrhythmias, impact on the organism, manifestations, ECG diagnosis
- Hemodynamic effects of tachycardia (including sinus tachycardia), impact on the heart, physiological and pathological mechanisms of induction of sinus tachycardia

Pulseless electrical activity

Prolonged QT interval syndrome

Syndrome of premature repolarization

Arterial hypertension

- Definition, normal and pathological values of blood pressure
- Factors determining systolic and diastolic blood pressure under normal and pathological conditions
- Systolic and diastolic hypertension
- Essential hypertension - etiological and risk factors, prevention, manifestation and consequences
- Secondary hypertension - definition, causes, examples of diseases, complications
- Malignant hypertension – definition, causes, pathogenesis, consequences, complications

Cardiac insufficiency and failure

- Definition, causes, pathogenesis, acute and chronic form
- Functional disturbances of the right and left heart
- Systolic and diastolic dysfunction – causes, pathogeny, consequences
- Volume and pressure overload of the heart
- Compensatory mechanisms, their importance and role in pathogenesis of consequences of the heart overload and insufficiency
- Consequences and manifestations of individual disorders of the heart function
- Cor dextrum translatum
- Heart tamponade
- Asthma cardiale

Hypertrophy and dilatation of individual parts of the heart – causes, pathogenesis, manifestations and consequences

Cardiomyopathy – definition, classification, causes, pathogenesis, manifestation and consequences

Pulmonary hypertension - causes, pathogenesis, manifestation and consequences, cor pulmonale

Thromboembolic disease - causes, risk factors, pathogenesis, consequences, prevention

Circulatory shock cardiogenic, hypovolemic, septic, anaphylactic

- Causes, characteristics, pathogenesis, course and consequences of individual types of the circulatory shock

- Compensation, decompensation, irreversible shock phase

Syncope

### **Multiorgan dysfunction and multiorgan failure**

- Definition of the concepts, characteristics, causes, pathogenesis and consequences

### **Pathophysiology of the endocrine system**

Principles of function of the endocrine system, principles of endocrine regulations under physiological and pathological conditions

General causes of diseases of the endocrine glands

Mechanisms of endocrine disorders

Classification of diseases of the endocrine glands, hypofunction, hyperfunction, eufunction

Pathophysiology of endocrine function of the hypothalamus

- The role of the hypothalamus in the hypothalamus- pituitary-peripheral glands systems

- Hypothalamic endocrine syndromes

Pathophysiology of the hypothalamus-neurohypophysis system

- Oxytocin – importance in medicine, role in behavior control

- Vasopressin (ADH)

- Origin, function and regulation of secretion of ADH

- Central and peripheral diabetes insipidus – causes, pathogenesis, consequences and manifestations

- Syndrome of inappropriate ADH secretion – causes, pathogenesis, consequences and manifestations, compensatory processes

Disorders of the hypothalamus-pituitary-adrenal axis

- Primary, secondary and tertiary disorders

- Hypothalamic statins and liberins and disorders of their production, distribution and function

- Adenohypophyseal hyper- and hypofunction syndromes – causes, pathogenesis, manifestations

- Dysfunction of the adenohypophysis – causes, pathogenesis, manifestation

- Manifestations and consequences of tumors of the adenohypophysis

- Manifestations and consequences of interruption of the hypothalamic-pituitary junction

Pathophysiology of the thyroid gland – thyroid hormones

- Regulation of the thyroid gland function, effects of thyroid hormones, the importance of iodine

- Reverse T3 and its role in normal and pathological situations, euthyroid sick syndrome

- Hyperthyroidism – causes, pathogenesis, manifestations (hyperthyroid syndrome) and consequences, thyrotoxic crisis

- Hypothyroidism inborn or acquired in the childhood

- Causes, manifestation, cretinism, role of an euthyroid or hypothyroid mother, endemic cretinism

- Hypothyroidism acquired in the adulthood

- Causes, manifestations (adult hypothyroid syndrome), myxedema, myxedema coma

- Pathophysiology of the thyroid gland inflammations – Graves-Basedow disease, Hashimoto's thyroiditis

- Goiter

- Eufunction, hyperfunction and hypofunction goiter – causes, mechanisms of development, manifestations



- Goiter genes
- Endemic goiter, ectopic goiter
- Nodes in the thyroid gland

#### Pathophysiology of the sex hormones

- Production of the sex hormones and its regulation, metabolism of sex hormones and disorders of these processes, role of the fat tissue in conversion of the sex hormones
- Hypergonadotropic and hypogonadotropic hyper- and hypogonadisms and their manifestations in dependence on the stage of the ontogenetic development, causes and mechanisms of the disorders
- Pathological and abnormal sources of the sex hormones

#### Pathophysiology of the adrenal cortex

- Structure and function of the adrenal cortex in relation to adrenal disorders
- Regulation of the adrenal cortex and its disorders
- Hypercorticalisms
  - Classification according to individual hormones and origin of the disorder
  - Cushing's syndrome - causes, pathogenesis, manifestations and consequences
  - Conn's syndrome - causes, pathogenesis, manifestations and consequences
  - Secondary hyperaldosteronism
    - Mechanisms of origin, manifestations, role in pathogenesis of diseases
  - Overproduction of the sex hormones in the adrenal cortex - causes, manifestations and consequences
- Hypofunction of the adrenal cortex
  - Selective insufficiency of the glucocorticoids – causes, manifestations and consequences
  - Hypoaldosteronism - causes, manifestations and consequences
  - The Addison's disease – causes, pathogenesis, manifestations and consequences, Addisonian crisis
  - Congenital adrenal hyperplasia, adrenogenital syndrome

#### Pathophysiology of the adrenal medulla and sympathoadrenal system, the pheochromocytoma

#### Pathophysiology of the parathyroid glands

- Primary and secondary hyper- and hypoparathyroidism, pseudohyperparathyroidism - causes, pathogenesis, manifestations and consequences

#### Pathophysiology of calcitonin – role in pathogenesis of the diseases, importance in medicine

#### Pathophysiology of the endocrine pancreas (Langerhans islets) - hyper- and hypofunction syndromes of individual hormones of the pancreas

#### Pathophysiology of natriuretic factors – their role in regulation of natremia and homeostasis of body fluids in physiological and pathological situations

#### Pathophysiology of the APUD system

#### Pathophysiology of the epiphysis

#### Pathophysiology of endocrine activity of the fat tissue

### **Pathophysiology of the reproductive system**

#### Disorders of man and woman fertility, sterility, infertility

#### Disorders of sex differentiation – list and classification of the disorders, manifestations and mechanisms of development

#### Pathophysiology of the male and female gonads – particular diseases, their causes, pathogenesis and manifestations

#### Preliminary puberty (pubertas and pseudopubertas praecox) and delayed puberty – definition, causes, manifestations

#### Disorders of menstruation – terminology, causes and pathogenesis

#### Pathophysiology of gravidity and parturition

- Complications of gravidity
- Early and late gestosis
- Perinatal complications – causes and consequences
- Fetal erythroblastosis

### **Pathophysiology of the bones**

Causes and mechanisms of disorders and diseases of the bones and disorders of the skeleton development

Osteoporosis, osteomalacia, rickets, osteodystrophia fibrosa cystica (morbus Recklinghausen), osteogenesis imperfecta – causes, pathogenesis, manifestations and consequences

Arthritis – causes, pathogenesis, consequences

Degenerative changes of the joints and the vertebral column – causes, risk factors, pathogenesis, manifestations and consequences

### **Pathophysiology of the muscles**

Control of skeletal muscle activity and its disorders

Motor unit and mechanisms and manifestations of change of its size

Tetanic contractions and their importance in pathological situations

Tetany and role of calcium

Rigor mortis

Energetics of muscle contraction, muscle fatigue, oxygen debt

Basic types of muscle diseases, manifestations of diseases of the skeletal muscles and their innervation, changes of muscle tone, fibrillation, fasciculation of the muscle

Manifestations of disorder skeletal muscle function

Myopathic syndrome

Myotonia

Muscle atrophy – definition, character, causes, manifestations

Muscle hypertrophy - definition, character, causes, manifestations

Pseudohypertrophy of the muscle – definition, causes, occurrence

Abnormal muscle contractions – examples, characteristics

Endocrine, metabolic, toxic, mitochondrial myopathies

Muscular dystrophias

- Causes, pathogenesis, manifestations and consequences

- Duchenne and Becker muscular dystrophy

Myositis

Rhabdomyolysis – definition, causes, consequences and their mechanisms

Crush syndrome – definition, consequences

Compartment syndrome – definition, causes and inducing factors, pathogenesis

Malignant hyperthermia

Diseases and disorders of function of the smooth muscles

### **Pathophysiology of the gastrointestinal tract**

Pathophysiology of the oral cavity

- Saliva secretion disorders, Sjögren's syndrome

- Disorders of food processing in the oral cavity

- Diseases of the oral cavity mucous membrane, manifestations of systemic diseases in the oral cavity

Pathophysiology of the esophagus

- Achalasia

- Esophageal diverticles – classification, causes and mechanism of their development, complications
- Hiatus hernia – types, consequences
- Pathophysiology of the gastroesophageal reflux – causes, pathogenesis, manifestations and consequences
- Consequences of perforation of the esophagus
- Esophageal varices – causes and mechanisms of their development, complications
- Pathophysiology of the stomach
- Disorders of stomach secretion and motility
- Pathophysiology of gastroduodenal ulcer disease and its complications
- Gastritis, pernicious anemia
- Pathophysiology of the small and large intestine
- Disorders of digestion and absorption of substances in the intestines
- Disorders of bowel secretion and motility
- Pathophysiology of the ileus - types, causes, pathogenesis and consequences
- Intestinal diverticles
- Crohn's disease, ulcerous colitis, gluten intolerance
- Intestinal tumors – etiology, risk factors, consequences
- Pathophysiology of exocrine pancreas
- Acute and chronic pancreatitis - etiology, pathogenesis, course and consequences
- Pancreatic secretion disorders - etiology, pathogenesis, consequences of decreased secretion
- Cystic fibrosis of the pancreas
- Disorders of swallowing and dysphagia
- Nausea and vomiting – mechanisms, vomiting reflex, causes, complications
- Dyspepsia – definition, causes
- Constipation - definition, causes, pathogenesis, consequences, prevention
- Diarrhea - definition, causes, pathogenesis, consequences
- Bleeding into the gastrointestinal tract – causes, manifestations and consequences, diagnosis and origin location
- Role of the microbial colonization of the gastrointestinal tract

## **Practical knowledge and skills I**

Knowledge of the problem including its relations to theoretical knowledge, practical application of the knowledge, ability to perform correctly practical tasks

### **Principles of science**

Scientific hypothesis

Experiment

Controlled, blind, double blind study

Laboratory animals

- Importance for biomedical research

- The most important and most commonly used types of laboratory animals

- Genetics of laboratory animals - strains genetically defined, partially defined, undefined

- Gnotobiology of laboratory animals - categories, ways of breeding

- Principles of working with laboratory animals

- Alternative methods

### **Statistics**

Definition and scope of statistics, basic terms  
Statistical set, importance of sample size  
Statistical variables  
Data presentation  
Statistical surveys  
Hypothesis testing  
Statistical and biological significance

### **Injection technique, pathophysiological aspects of injection administration**

Basic principles of injection technique  
Types of injections for systemic and local application of substances - characteristics, use, principles  
Pathophysiology of complications of injections  
Calculation of the applied dose

### **Anesthesia**

Definition  
Local anesthesia  
- Definition  
- Local anesthetics - pharmacology, examples of substances, mechanism of effect  
- Methods of application of local anesthesia  
- Factors influencing the effectiveness of local anesthesia  
- Complications of local anesthesia  
General anesthesia  
- Methods of administration and their characteristics  
- Examples of general anesthetics and their characteristics  
- Pharmacokinetics of general anesthetics  
- Stages of general anesthesia - definition, characteristics  
- Complex management of general anesthesia  
- Premedication, premedication, analgesia, vegetative stabilization, myorelaxation  
- Myorelaxation -types of myorelaxants, their characteristics, complications and risks of administration

### **Pathophysiological aspects of wound treatment**

Basic surgical instruments and their applications  
Types of surgical needles and threads, their use  
Types of surgical sewing materials (absorbable, non-absorbable, monofilament, braided) - use, features, advantages and disadvantages, examples, fiber strength  
Threading the surgical needle, surgical knot  
Surgical stitches  
- Single simple stitch, serial stitch, single and serial mattress stitch, single and serial Donati stitch, single and serial Allgöwer stitch, intradermal stitch, tobacco stitch  
- Advantages and disadvantages of particular stitches  
- Principles of surgical sewing in respect to wound healing course  
Extraction of stitches  
Asepsis, antisepsis - definition of concepts, methods, preparation of the surgical field

### **Use of electricity in medicine**

Active and passive electrical properties of tissues  
Ohm's law

Electrocardiography, electroencephalography, electromyography, electroneurography, electrooculography

Examination of the presence of muscle mass, fat and its distribution and water in the body

### **Electrocardiography**

Principles of ECG examination, leads, electrodes, Einthoven's triangle, examples of non-standard leads and their application

Physiological ECG curve

ECG record description - action, frequency, rhythm, electric axis declination, description of individual parts of the curve

ECG diagnosis – disturbances of impulse origin (sinus arrest, nodal rhythm, idioventricular rhythm, extrasystoles, respiratory arrhythmia, nonrespiratory sinus arrhythmia, sinus tachycardia, supraventricular tachycardia, ventricular/wide complex tachycardia, atrial fibrillation and flutter, ventricular fibrillation and flutter, stimulated rhythm, pulsus alternans), disturbances of impulse transmission (sinoatrial blocks, atrioventricular blocks, bundle branch blocks, fascicular block, block in arborisation, preexcitation), angina pectoris, myocardial infarction (type, stage, localization), P mitrale, P pulmonale, pulmonary embolism, ventricular overload and hypertrophy, pericarditis, changes in ion levels, pulseless electrical activity, prolonged QT interval syndrome, syndrome of premature repolarization

Explanation of the basics of ECG changes in individual diagnoses, pathophysiology of these diseases and states

### **Measurement of blood pressure**

Measurement of systolic and diastolic blood pressure by mercury and digital tonometer

Principles and rules of blood pressure measurement

Normal and pathological resting values of systolic and diastolic blood pressure

### **Examination of hemorrhagic diatheses**

Rumpel-Leede test - principle, execution, calculation of mean arterial pressure

Quick's test – principle and application

aPTT – principle and application