

PROGRAMM OF PATHOPHYSIOLOGY FOR EXAM

I. GENERAL PATHOPHYSIOLOGY

SUBJECT OF PATHOPHYSIOLOGY

Objectives of pathophysiology. Methods of pathological physiology. Acute and chronic experiments. Etiology. Description of main etiological factors. Pathogenesis. Health and disease. Periods of disease (latent, beginning of disease, manifestations of disease, outcomes of diseases).

DISORDERS OF MICROCIRCULATION

Causes, mechanisms and manifestations of microcirculation disturbances. Classification of microcirculation disturbances. Arterial hyperemia: causes, symptoms, and consequences. Venous hyperemia: causes, symptoms, and consequences. Ischemia: causes, symptoms, and consequences. Stasis: causes, symptoms, and consequences. Blood rheological and plasma composition disturbances.

Embolism. Exogenous and endogenous embolism. Consequences. Embolism by a blood clot. Causes of pulmonary, brain, cardiac embolism. Causes of fat, gas and air embolism development.

INFLAMMATION

Causes and mechanisms of main inflammation signs development. Inflammation (flogosis). Exogenous and endogenous causes of inflammation. Inflammation stages (alteration, exudation and emigration, proliferation). Alteration. Primary and secondary alteration. Particularities of metabolism at alteration. Physicochemical changes at alteration. Description of microcirculation breaking in area of inflammation (short ischemia, arterial hyperemia, venous hyperemia, stasis) and mechanisms of their development. Exudation. Its biological value. Difference exudates from transudations fluid.

Leukocyte recruitment: margination, adherence to vascular wall, emigration through vascular wall, chemotaxis. Phagocytosis. Stages: chemotaxis, adherence to bacteria, absorption (phagosome formation), digestion (phagolysosome formation). Pus. Composition. Proliferation and regeneration. Types to regenerations. Categorization of inflammation: on velocities of development (sharp, subsharp, chronic), on dominating stage (alterative, exudative, proliferate), on the exudate type (serous, festering, fibrinous, hemorrhagic and others).

Local signs of inflammation (rubor, tumor, dolor, color, functio laesae) and mechanisms their development. General reactions at the inflammation (fever, leukocytosis, increase growing of settling an red blood cells and others.). Inflammation mediators (histamine, bradykinine, complement system, prostaglandins, leukotrienes). Role of mediators. Outcomes of inflammation. Factors, influencing upon the current of inflammation. Biological role of inflammation.

THERMAL REGULATORY DYSFUNCTION. FEVER. HYPERTHERMIA. HYPOTHERMIA

Fever. Causes and mechanisms of fever development, its biological role, etiopathogenesis and consequences of hyperthermia and hypothermia influence on the organism.

Categorization. Etiology of fevers. Pyrogens (exogenous and endogenous). Pyrogen's action mechanism. Stage of fevers, their feature. Changing a metabolism in the organism at the fever. Changing the functions of organism at the fever. Types warm-up crooked. Biological role of fever.

Hyperthermia. Causes. Disturbances at organism under hyperthermia. Differentiation hyperthermia from the fever.

Hypothermia. Causes. Breaking in the organism under hypothermia. Hypothermia using in medicine.

REACTIVITY AND RESISTENCE. IMMUNOLOGICAL DISORDERS. CATEGORIZATION. AIDS.

Reactivity. Types of reactivity (typical, group, individual). Physiological and pathophysiological reactivity. Specific and nonspecific mechanisms of reactivity. Degree of reactivity (normoergic, hyperergic and hypoergic). Resistance. Local and common resistance, hereditary and acquired. Factors, which determine the reactivity and resistance (heredity, constitution, sex, environmental and social factors). Immunological disorders. Categorization. AIDS. Etiology. Clinical symptoms and mechanisms of their development.

ALLERGY.

Allergy. Causes. Allergens, their categorization and description. Types of allergic reactions. Pathogenesis of allergic reactions of different types. Stages of allergy: (immunological stage, pathochemical stage, pathophysiological stage). Allergic mediators. Sensibilization. Experimental model of anaphylactic shock on guinea pig. Description of allergic disorders (allergic rhinitis (pollinosis), bronchial asthma, e.g.). Desensibilization (hyposensibilization).

PATHOPHYSIOLOGY OF METABOLISM FASTING.

Types of fasting. Metabolic and functional disturbances at fasting. Principles of fasting therapy. Therapeutic fasting.

Consequences of total and partial fasting (carbohydrates, lipids and protein deficit). Protein-calorie malnutrition. Particularities in children (Kwashiorkor).

PATHOLOGY OF CARBOHYDRATE METABOLISM.

Causes and consequences of carbohydrate digestion disturbances. Symptoms. Lactase deficiency.

Hyperglycemia. Types. Consequences. Hypoglycemia. Types. Consequences.

Causes and consequences of carbohydrate intermediary metabolism. Causes and consequences of lipid intermediary metabolism.

Diabetes mellitus. Etiology. Types and their particularities. Pathogenesis of diabetes mellitus. Main metabolic disturbances. Clinical symptoms of diabetes mellitus and mechanisms of their development. Complications of diabetes mellitus. Types of comas and their pathogenesis. Diabetic vascular complications. Pathogenesis of atherosclerosis, diabetic nephropathy, diabetic retinopathy, peripheral neuropathy.

PATHOLOGY OF LIPID METABOLISM.

Role of lipids in organism. Causes and consequences of lipid digestion disturbances. Symptoms. Steatorrhea. Hepatic role in lipid metabolism. Plasma lipoprotein's composition and functions. Apoproteins. Hyperlipidemias. Types (classification) (by World Health Organization). Causes and consequences.

Obesity. Types. Causes and consequences. Hepatic lipid infiltration and dystrophy. Causes and consequences.

Pathogenesis of atherosclerosis. Atherogenic and antiatherogenic lipoproteins. Risk factors of atherosclerosis development.

PATHOLOGY OF PROTEIN METABOLISM.

Biological role of proteins, peptides and amino acids. Consequences of amino acid insufficiency. Causes and consequences of protein digestion disturbances. Symptoms. Celiac-sprue. Causes of protein insufficiency. Consequences. Causes and consequences of intermediary amino acid's metabolism.

Pathology of plasma protein composition. Dysproteinemias types and feature. Types of residual plasma nitrogen level increasing. Mechanisms of their development.

Gout. Pathogenesis. Symptoms and therapy.

PATHOLOGY OF WATER-MINERAL BALANCE.

Role of hormones in regulation of water-mineral balance. Classification of water-mineral disturbances. Negative water-mineral balance. Hypo-, iso- and hyperosmolaric types of dehydration. Causes, symptoms and consequences. Therapy. Positive water-mineral balance. Types of hyperhydration. Water poisoning. Causes, symptoms and consequences. Therapy.

Edema, classification. Influence factors of edema development. Pathogenesis of cardiac, renal, hepatic, inflammatory, allergic, toxic edema.

Disturbances of mineral metabolism (Na^+ , K^+ , Ca^{+2}).

CLASSIFICATION OF ACID-BASE DISTURBANCES.

Acidosis and alkalosis. Feature. Parameters of acid-base balance under respiratory and metabolic acidosis. Parameters of acid-base balance under respiratory and metabolic alkalosis.

PATHOLOGY OF VITAMIN METABOLISM.

Deficiency of water-soluble vitamins (B_1 , B_2 , B_6 , B_{12} , C, PP). Deficiency of fat-soluble vitamins (A, D, E, K).

CELL PATHOLOGY. Types of cell injury. Mechanisms of cell damage. Causes and consequences of cell energy production disturbance. membrane damage. Oxidative stress as general mechanism of cell injury. Mechanisms of antioxidative defense. Ion distribution in extra- and intracellular space. Role of the ions in the cell function during pathological conditions. The mechanisms of transcellular communication (eicosanoids, hormones and cellular growth factors). Role of calcium in cell function and injury. Consequences of organelles injury (membrane, nuclear, mitochondria, ribosome, etc.). Necrosis as general mechanism of accidental cell death. Role of calcium, lysosomal enzymes and reactive oxygen species in necrosis development. Apoptosis. The mechanisms of initiation of apoptosis. Stages. Consequences. Comparison of characteristic of apoptotic and necrotic cell death. Mechanisms of cell defense against damaging factors. Reparative processes in injured cells.

HYPOXIA. HYPEROXIA.

Normal air, alveoli and blood gas parameters. Nervous and humoral regulation of respiration and blood gas parameters. Definition of hypoxia. Classification. Causes and changes of blood gas parameters at hypoxic hypoxia. Causes and changes of blood gas parameters at respiratory, blood-dependent, circulative tissue hypoxia, hyperoxic hypoxia, hypoxia of overload. Acute and chronic compensatory mechanisms to hypoxia. Hyperoxia. Dangerous.

ROLE OF HEREDITY IN PATHOLOGY

Base of congenital function. Cariotype, genotype, phenotype. Congenital diseases.

Etiology and pathogenesis of congenital diseases. Mutations and mutagens (alcohol, nicotine, radiation e.g.). Categorization of congenital diseases. Genome diseases. Sex-chromosomes and autosomes related diseases. Gene diseases: metabolic diseases (glycogenosis, phenylketonuria, galactosemia e.g.), blood diseases (hemoglobinosis S, elliptocytosis, hemophilia e.g.). Investigative methods for congenital diseases: genealogical, population-statistical, cytogenetical, Cytochemical, dermatoglyphical. Diseases of congenital supports. Embryopathic and fetopathic disorders. The critical periods of pregnancy. Medico-genetic consulting. Constitution. Types of constitution.

EXTREME CONDITIONS. STRESS. SHOCK. COMA. COLLAPSE

Stress. Definition. Theory of stress (H. Selye, 1938). Pathophysiology of stress. The role of sympathoadrenal and hypothalamo-hypophys-adrenal systems in stress.

Stress stages. Distress syndrome. Shock. Definition. Pathophysiology of shocks. Stages of shock and their mechanisms. Types of shock. Mechanisms of decompensation at shock.

Collapse, its causes and development. Difference between collapse and shock. Coma. Definition. Causes and types.

TUMOR GROWING

The tumor growth. Malignant and nonmalignant tumors. Description.

Kinds of tumor atypism: morphological, biochemical, physicochemical, antigenic, functional. Etiology of tumors. Theories: radioactive, chemical, viral, genetical.

Pathogenesis of tumor growth. Stages: transformation, promotion, progression.

Tumor influence on the organism. Tumor disease. Pathogenesis of cancer cachexia.

Antitumor activity of human organism.

RADIATION SICKNESS

Radiation. Issues and power of different radiation rays. Units of radiation assay.

Mechanisms of radiation inflow on the organism. Water radiolysis, lipid peroxidation and DNA mutations. Clinical types of radiation sickness. Dependence by dose. Pathophysiology of bone marrow form of radiation sickness. Its stages. Mechanisms of remote consequences of radiation inflow on the organism.

II. PATHOPHYSIOLOGY OF ORGANS AND SYSTEMS

PATHOPHYSIOLOGY OF BLOOD

DISORDERS OF CIRCULATIVE BLOOD VOLUME (HYPERVOLEMIA, HYPOVOLEMIA). BLEEDING.

Blood, its composition and functions. Hematocrit. Stages of erythropoiesis. Categorization of disorders of circulative blood volume (hypervolemia, hypovolemia).

Hypervolemia. Types (simple, polycythemic, oligocythemic). Causes and outcomes. Hypovolemia. Types (simple, polycythemic, oligocythemic). Causes and outcomes.

Erythrocytosis. Polycythemia vera or Wakes's disease.

Bleeding. Types and causes. Pathogenesis and main clinical symptoms of acute bleeding. Compensatory-adaptative reactions under acute bleeding. Stages of compensation (reflex, hydremic, bone-marrow). Parameters of severity of bleeding. Factors which effect bleeding outcome. Causes and outcomes. Therapy of bleeding.

ANEMIAS.

Clinical symptoms of anemia and mechanisms of there development. Categorization of anemias by: etiopathogenesis, color parameter, severity of anemia, regenerative possibility, type of hematopoiesis, erythrocyte's size.

Post-hemorrhagic anemia. Description, the picture of the blood under acute and chronic post-hemorrhagic anemia.

Iron deficiency anemia. Etiology, pathogenesis. Sideropenic syndrome. The picture of the blood.

Vitamin B₁₂ and folic acid deficiency anemia. Etiology, pathogenesis. The picture of the blood. Addison-Biermer disease.

Hemolytic anemia. Types (congenital, autoimmune e.g.). The picture of the blood. Clinical symptoms. Newborn hemolytic anemia.

LEUKOCYTOSIS. LEUCOPENIAS.

Stages of leucopoiesis. Leukocyte's description on different stages of leucopoiesis. Leukocyte's functions (neutrophils, eosinophils, basophils, monocytes, lymphocytes).

Leukocytosis. Categorization. Causes of leukocytosis (neutrophilic, eosinophilic, basophilic, monocytic, lymphocytic).

Leucopenia. Categorization. Causes and outcomes of neutropenia, lymphopenia. Agranulocytosis.

Leukocyte's formula. Nuclear shift of leukocyte's formula to left, to right. Clinical importance of leukocyte's formula calculation.

LEUKEMIA.

Leukemia. Definition. Etiology. Pathogenesis of leukemia. The particularities of leukemic cells. Categorization of leukemia (acute and chronic).

Characteristic of morphological picture of blood at acute and chronic myeloid and lymphoid leukemia. The leukemia clinical syndromes.

Clinical syndromes under leukemia: anemic, hemorrhagic, infective, metastatic, and intoxicative. Leukemic reactions and the pathogenesis.

PATHOLOGY OF HEMOSTASIS.

Components of hemostasis (blood vessel, platelets, plasma coagulation factors), primary and secondary hemostasis. Disorders of hemostasis (thrombophylic, hemorrhagic, thrombohemorrhagic hemostasiopathias).

Thrombosis. Outcomes and consequences. Mechanism of white and red thrombosis development. Causes and conditions of thrombosis development. Virchow's triad (vascular injury, blood coagulant system activation, blood flow decrease).

Hemorrhagic disorders of hemostasis.

Hemorrhagic disorders of hemostasis: disorders of blood vessels, disorders of platelets, coagulation disorders. Disorders of blood vessels. Reasons and mechanisms of their development, clinical manifestations: scurvy, Henoch-Schonlein purpura, Rendu-Osler-Weber syndrome.

Thrombocytopenia and qualitative disorders of platelets. Reasons and features.

Autoimmune thrombocytopenic purpura. Congenital disorders of platelet function. Glansman thrombasthenia. Von Willibrand's disease.

Coagulation disorders. Coagulopathies, classification. Causes. Hemophilia (type A, B). Features.

Disseminated intravascular coagulation (DIG). Causes. Stages, mechanisms of development.

PATHOPHYSIOLOGY OF NERVOUS SYSTEM.

Etiology of nervous system disorders. Neurone pathology Causes. Disorders of synaptic transmission. Effects of different poisons. Myasthenia gravis. Denervation syndrome in somatic and internal organs. Disturbances of locomotion. Central and peripheral paralysis. The causes. Hyperkinesias. Kinds. The causes. Disturbances of sensitivity. Character of sensitivity infringements depending on level of damages of various departments of the evaluator of sensitivity. Brown-Sequard's syndrome. Pain, its role in organism ability to live. The causes and occurrence mechanisms. Pain kinds (visceral and somatic), their characteristic. Causalgia. Nociceptive and antinociceptive systems.

PATHOPHYSIOLOGY OF HIGH NERVOUS SYSTEM ACTIVITY.

Classification of types of high nervous system activity. A role of the generator of pathologically enhanced excitation, pathological system in occurrence of a pathology of the excitatory system. Common etiology of high nervous system activity disorders.

Neurosis. Classification of neuroses. The characteristic. Exhibitions. Means of modelling of experimental neuroses. An information triad, its role in occurrence of neuroses. Neurasthenia. Hysteria. Phobic disorders.

Narcomanias. The causes. Effects of opioids on body systems. Abuse of narcotics. Pathogenesis. Abstinence syndrome.

Influence of alcohol on an organism. The characteristic of exhibitions of acute intoxication. Severity levels.

Syndrome of dependence on alcohol (alcoholism). Stages, the characteristic of infringements. An abstinence syndrome. Occurrence mechanisms.

Infringements of intelligence, memory, emotions, behaviour, etc.

Alzheimer's disease. Schizophrenia.

The characteristic of exhibitions and a cause of infringement of a cycle a sleep-wakefulness.

PATHOPHYSIOLOGY OF ENDOCRINE SYSTEM.

Nature of hormones. Mechanism of hormone action. Hormonal regulatory systems. Pathologic mechanisms of endocrine disease. Causes of hormone excess and deficiency.

Hypopituitarism. Etiology and pathogenesis. Nanism. Panhypopituitarism. Acromegaly and gigantism. Etiology and pathogenesis. Syndrome of inappropriate antidiuretic hormone (ADH) secretion. Diabetes insipidus. Parhorm syndrome.

Hyperaldosteronism (Conn's disease), Cushing's disease and syndrome, congenital adrenal hyperplasia. Pheochromocytoma. Itsenko-Cushing's disease and syndrome, congenital adrenal hyperplasia. Adrenogenital syndromes. Acute and chronic adrenal gland insufficiency. Addison disease. Pheochromocytoma.

Hyperthyroidism. Etiology. Pathogenesis of main symptoms.
Hypothyroidism. Etiology. Pathogenesis of main symptoms.

Hyperparathyroidism. Hypoparathyroidism. Etiology. Pathogenesis of main symptoms.

Pathophysiology of sex glands. Hypogonadism. Hypergonadism.

PATHOLOGY OF RESPIRATORY SYSTEM.

Pulmonary volumes and capacities. Respiratory failure (etiology, causes, symptoms). Types of disturbances of alveolar ventilation. Obstructive and restrictive disturbances.

Asthma. Pneumothorax. Emphysema. Etiologia. Pathogenesis.

Diffusion infringements. Etiopathogenesis. Infringement perfusion. The characteristic. The causes.

Pulmonary hypertension. Pulmonary edema.

Pathogenesis of periodic breathing (Cheyne-Stokes, Biote Cussmaul).

PATHOPHYSIOLOGY OF CARDIOVASCULAR SYSTEM.

Classification of blood circulation pathology. Etiology and pathogenesis of heart failure. Main symptoms of acute heart failure. Myocardial infarction. Etiology and pathogenesis. Consequences. Cardiogenic shock and acute pulmonary edema. Etiology and pathogenesis. Chronic heart failure. Etiology. Stages. Pathogenesis of main clinical symptoms.

ARRHYTHMIAS.

Common etiology heart rhythm disturbances. Classification of infringements of a heart rhythm. Mechanisms of arrhythmias. Automatism infringement. Kinds. Sinus rhythm pacemaker abnormalities (sinus tachycardia, bradycardia, arrhythmia).

Excitability infringement. Occurrence mechanisms. Kinds. Extrasystoles. Atrial ectopic beats, atrial flutter, ventricular ectopic beats, ventricular fibrillation.

Conductivity infringements. Blockages. Kinds. The causes and development mechanisms. Blocks (intraatrial, sino-atrial, atrioventricular, intraventricular). Consequences of infringements of a warm rhythm for an organism.

HYPERTENSION. HYPOTENSION. Factors involved in regulation of blood pressure. Severity levels of an arterial hypertensia. Stages.

Primary and secondary hypertension. Classification. Risk factors. A role of endothelium dysfunction in a pathogeny of an arterial hypertension. Clinical exhibitings of a hypertensia. Consequences for an organism (complication). Signs in hypertension pathogenesis. Outcomes of hypertension. Experimental hypertension. Primary and secondary hypertension. Classification. Hypertensia of a small circle of a circulation of blood. Hypotension. The causes.

PATHOPHYSIOLOGY OF KIDNEY.

Role of kidney in an organism. Etiology and pathogenesis of kidney disease.

Pathogeny of infringements of formation of urine (infringement of a filtration, a reabsorption, secretion and excretion). The causes and mechanisms of infringements of a diuresis. Quantitative and qualitative infringements of formation

of urine (oliguria, anuria, polyuria). Hypostenuria, isostenuria, hyperstenuria. The causes.

Infringements of composition of urine. Pathological components of urine.

Pathogenesis of acute glomerulonephritis. An aetiology, a pathogeny and the basic exhibitings. Mechanisms of development of a hypertensia and hypostases at nephrites.

Consequences of chronic glomerulonephritis.

Pyelonephritis. Etiopathogenesis. The characteristic of infringements.

Nephrotic syndrome, Clinical exhibitings. A pathogeny of hypostases at nephrotic syndrome.

Pathogenesis of nephritic and nephrotic oedema.

Renal insufficiency. An uraemia. Concept of hemodialysis (an artificial kidney).

Urolithic illness. Factors and the mechanisms promoting formation of stones.

PATHOPHYSIOLOGY OF LIVER.

Studying of functions of a liver in experiment and clinic. Functional trials.

Hepatitis. Cirrhoses. Fatty a liver dystrophia. A role of alcohol and other factors in occurrence of diseases of a liver.

Insufficiency of a liver. The causes. Development stages. Their characteristic. Hepatic coma. Symptoms and mechanisms of their occurrence. Therapy principles. Concept about haemosorption. A liver transplantation.

Portal hypertension. The causes. The characteristic надпеченочной, hepatic and подпеченочной a portal hypertension.

Jaundice. Kinds. The characteristic of infringements of a pigmental exchange at separate kinds of jaundices (haemolytic, liver, mechanical).

Cholemia. The basic mechanisms and exhibitings of cholemia. Cholestasis. The causes of cholestasis. Infringements in an organism at cholestatic syndrome.

Gallstone disease. Etiology. Risk factors.

PATHOPHYSIOLOGY OF GASTROINTESTINAL TRACT.

Role of digestive organs. Aetiology of diseases of a gastrointestinal disorders. A role of alcohol, smoking and other factors in their occurrence.

Disorders of appetite. (an anorexia, гиперрексия, a bulimia, полифагия). The causes of infringements. Disorders of food intake.

Digestion distresses in an oral cavity (mastications, salivations, swallowings). The causes and consequences. Caries of dens. Etiopathogenesis, preventive maintenance.

Infringements of function of an esophagus. Dysphagia. Achalasia. Gastro-oesophageal reflux

Pathology of digestion in stomach Quantitative and qualitative infringements of secretory function of a stomach. Pathologic types of gastric secretion. Achlorhydria. Achylia.

Etiology and pathogenesis. Symptoms of gastritis. nausea, vomiting.

Peptic ulcer. Etiology. Pathogenesis. A role stress factors, Helicobacter pylori.

Pathology of digestion in intestine. Syndromes maldigestion, malabsorption.
Causes and mechanisms of disturbances. Causes of diarrhoea. Consequences.
Disbacteriosis. Etiology and pathogenesis. Consequences.
Pancreatitis. Etiology and pathogenesis.

LIST OF PRACTICAL SKILLS

List of practical skills:

The students have obligated:

1. **To use** proficiency:
 - obtained knowledge in clinical practice;
 - electrocardiogram in cardiac arrhythmia diagnosis;
 - parameters of pulmonary ventilation for revealing of disorders of lung functions;
 - blood gas parameters for determine of hypoxia type;
 - parameters of pigment metabolism for determine of jaundice type;
 - data of stomach juice for eliciting of pathological gastric secretion type;
 - obtained practical skills during experiments on the animals, anesthesia, taking of investigative material, analysis of obtained results and conclusions according *Principles for the Care and Use of Animals* recommended by the Ethical Committee

2. **To wield** the methods of:
 - calculation and estimation of value in blood:
 - red blood cells (erythrocytes) level;
 - white blood cells (leucocytes) level;
 - platelets (thrombocytes) level;
 - reticulocytes level;
 - leukocytemic formula;
 - hematocrit
 - hemoglobin;
 - color index
 - determine of pathological blood cells in blood samples;
 - differentiation of leukemia by blood picture;
 - performing in experimental animals:
 - anesthesia;
 - subcutaneous, intravenous, intramuscular infusions
 - taking of blood samples;
 - registration of temperature
 - registration of electrocardiogram

