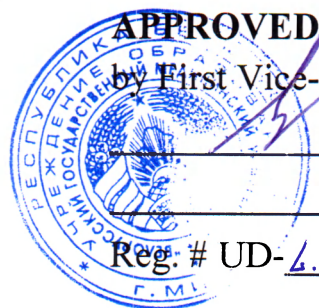


MINISTRY OF HEALTH OF THE REPUBLIC OF BELARUS
Educational Institution
BELARUSIAN STATE MEDICAL UNIVERSITY

Контрольный
экземпляр



APPROVED

by First Vice-Rector, Professor

I.N.Moroz

16. 11. 2022

Reg. # UD-4.701/2223/edu.

PATHOLOGIC PHYSIOLOGY

**Curriculum of higher educational institution
in the academic discipline for the specialty:**

1-79 01 07 «Dentistry»

Curriculum is based on the educational program «Pathological Physiology», approved 16.11.2022, registration # УД-Л.701/2223/уч.; on the educational plan in the specialty 1-79 01 07 «Dentistry», approved 18.05.2022, registration # L 79-1-7/2223/mf.

COMPILERS:

F.I.Vismont, Head of the Pathological Physiology Department of the educational institution «Belarusian State Medical University», D.Sc., Professor, Corresponding Member of National Academy of Sciences of the Republic of Belarus;

S.A.Zhadan, Associate Professor of the Pathological Physiology Department of the educational institution «Belarusian State Medical University», PhD, Associate Professor

RECOMMENDED FOR APPROVAL:

by the Pathological Physiology Department of the educational institution «Belarusian State Medical University»
(protocol # 4 of 14.11.2022);

by the Scientific and Methodological Council of the educational institution «Belarusian State Medical University»
(protocol # 9 of 16.11.2022)

EXPLANATORY NOTE

«Pathologic Physiology» is an academic discipline of the «Medical and Biological Module 2» module, which contains systematized scientific knowledge about the life activity of a sick organism, the nature and mechanisms of resistance to diseases, the general patterns of the occurrence, development and outcome of diseases.

The purpose of the discipline «Pathologic Physiology» is the formation of basic professional competence, the basis of which is knowledge of the general patterns and mechanisms of occurrence, development, outcomes of diseases and pathological processes for the detection and prevention of disease states and diseases.

The objectives of the discipline «Pathological Physiology» are to form students' scientific knowledge about:

- the basic concepts of general nosology, the role of the causes and conditions of the external and internal environment, as well as the reactive properties of the human body in the onset, development and outcome of the disease;

- causes and mechanisms of typical pathological processes and reactions, their significance for the human body and manifestations in various diseases;

- causes, mechanisms and most important manifestations of typical disorders of organs and functional systems of the human body;

- risk factors for major non-communicable diseases (cardiovascular, oncological, metabolic diseases);

- skills and abilities necessary for interpreting the data of instrumental and laboratory studies and formulating, based on them, a conclusion about the causes and mechanisms of the development of pathology.

The knowledge, skills and abilities gained in the study of the discipline «Pathologic Physiology» are necessary for the successful study of the discipline «Pharmacology», modules: «General Clinical Therapeutic Module 1», «General Clinical Therapeutic Module 2», «General Clinical Surgical Module».

A student who has mastered the content of the educational material of the academic discipline must have the following basic professional competence:

BPC. To use knowledge about the etiology and pathogenesis of general pathological processes, typical forms of pathology of organs and systems of the human body when conducting a pathophysiological analysis of laboratory data.

As a result of studying the discipline «Pathologic Physiology», the student should

know:

- basic concepts of general nosology;

- causes, main mechanisms of development and outcomes of typical pathological processes;

- the main patterns and mechanisms of the development of the disease and recovery;

- compensation mechanisms and principles of correction of structural and functional disorders in typical forms of pathology of organs and systems of the human body;

the role of experimental research in the study of pathological processes, their possibilities and limitations, requirements for the experiment and the experimenter;

be able to:

identify and evaluate pathological and compensatory-adaptive reactions, functional reserves of the human body in various forms of pathology;

to carry out pathogenic analysis of hemograms of patients;

give an opinion on the hemogram about the presence of typical forms of pathology of the blood system, assess the severity of the changes that have occurred;

identify and evaluate typical disorders of the acid-base state, their mechanisms and degree of compensation;

identify the main types of cardiac arrhythmias, liver and kidney function according to clinical and additional research methods;

master:

methods for conducting a pathophysiological analysis of clinical, laboratory and experimental data and formulating, based on them, conclusions about the possible causes and mechanisms for the development of pathology;

skills of pathophysiological analysis of clinical symptoms and syndromes;

methods of substantiation and use of etiological and pathogenic principles of prevention and treatment of diseases.

Total number of hours for the study of the discipline is 210 academic hours. Classroom hours according to the types of studies: lectures - 24 hours, laboratory classes (practical classes – 81 hours), supervised student independent work - 8, student independent work (self-study) - 105 hours.

Intermediate assessment is carried out according to the syllabus of the specialty in the form of a credit (4th semester), and examination (5th semester).

**ALLOCATION OF ACADEMIC TIME
ACCORDING TO SEMESTERS OF STUDY**

Code, name of the specialty	semester	Number of academic hours						Form of intermediate assessment
		total	in-class	including			out-of-class self-studies	
				lectures (including supervised independent work)	supervised student independent work	laboratory studies (practical classes and seminars)		
1-79 01 07 «Dentistry»	4	120	60	10	2,5	48	60	credit
	5	90	45	14	5,5	33	45	examination
Total		210	105	24	8	81	105	

THEMATIC PLAN

Name of section	Number of classroom hours	
	lectures	practical
1. General nosology	2	21
1.1. Introduction. General questions of the doctrine of the disease. General etiology and pathogenesis	2	6
1.2. Pathogenic influence of environmental factors on the human body	-	9
1.3. The role of the reactivity, constitution and age in pathology	-	3
1.4. The role of heredity in pathology	-	3
2. Typical pathological processes	8	27
2.1. Disorders of peripheral circulation and microcirculation	-	6
2.2. Cell injury	2	1
2.3. Inflammation	2	5
2.4. Pathophysiology of thermoregulation. Fever and hyperthermia	2	3
2.5. Typical metabolic disorders	-	6
2.6. Hypoxia	-	3
2.7. Tumor growth	2	3
3. Pathophysiology of organs and systems	14	33
3.1. Pathophysiology of the blood system	-	9
3.2. Pathophysiology of the circulatory system	4	6
3.3. Pathophysiology of external respiration	2	2
3.4. Pathophysiology of the digestive system	2	2
3.5. Pathophysiology of the liver		2
3.6. Pathophysiology of the kidneys	2	2
3.7. Pathophysiology of the endocrine system	2	2
3.8. Pathophysiology of the nervous system	2	2
Total hours	24	81

CONTENT OF EDUCATIONAL MATERIAL

1. General nosology

1.1. Introduction. General questions of the doctrine of the disease.

General etiology and pathogenesis

Pathological physiology as fundamental science and educational discipline. Subject and tasks of Pathophysiology: its place in the system of medical education, as the theoretical basis of modern clinical medicine. Value of pathophysiological researches for development of preventive health care, improvement and development of new methods and means of diagnosis and diseases treatment.

Brief information on the history of Pathophysiology; main stages of its development. Value of works V.V.Pashutin, A.B.Foht, I.I.Mechnikov, A.A.Bogomolets, N.N.Anichkov, S.S.Halatov, P.N.Veselkina, G.N.Saharov, A.D.Speranskii, L.O.Orbeli, V.V.Parin, I.R.Petrov, N.N.Sirotinin, A.M.Chernukh, P.D.Gorizontov, G.N.Kryzhanovsky, A.D.Ado, R.Virhov, Yu.Kongeym, K.Bernar, U.Kennon, F.Bernet, H.Selye and other most prominent researchers of in the pathophysiology development.

Methods of pathological physiology. The value of experiment in the development of experimental and clinical medicine pathophysiology. General principles of biomedical experiments and their results interpreting. Modern methods used in pathophysiological experiment. Modeling: its types, capabilities and limitations. Animal model of various forms of pathological processes and protective-adaptive reactions in man; value of comparative evolutionary method. Moral and ethical aspects of experiments on animal. Role of the newest advances in molecular biology, genetics, biophysics, biochemistry, electronics, mathematics, cybernetics, ecology and other sciences in the development of modern pathophysiology. Experimental therapy as an important method for the study of diseases and the development of new treatment methods.

The concept of clinical pathophysiology, its challenges and opportunities. Possibilities and limitations, deontological aspects of research on humans.

Basic concepts of general nosology. Norm, health, transition of the body state between health and disease. The concept of the pathological response, the pathological process, pathological condition, disease. Typical pathological processes. Illness as a dialectical unity of damage and protective-adaptive (sanogenic) reactions of organism; systemic principle in pathology; the integrity of the organism. Stage of the disease, its outcomes. Complete or incomplete recovery. Remission, relapse, complications. Value of biological and social factors in human pathology.

Terminal condition. Dying as a staging process. Preagonal state, the agony, clinical death, biological death. Pathophysiological basis of resuscitation. Principles of recovery, temporary substitution of impaired functions of the circulatory and respiratory systems, correction of metabolic changes. Postresuscitation disorder. Social and ethical aspects of resuscitation.

The value of biological and social factors in human pathology. Social criteria of the disease. The principles of disease classification; classification of the WHO (world health organization), ICD-10 (international classification of diseases).

Principles of determinism in pathology. The role of causes and conditions, morphofunctional characteristics of the macroorganism, their dialectical relationship in disease occurrence. The concept of the disease external and internal reasons. The concept of poli-etiological diseases. The principles of diseases classification.

The definition of pathogenesis. Damage as a primary link in the pathogenesis. Injury levels: submolecular, molecular, subcellular, cellular, organ, tissue, organism. Manifestation of injury at different levels of the body. The unity of structural and functional changes in pathogenesis of diseases. The role and place of the etiological factor in the pathogenesis. The cause-and-effect relations in the pathogenesis; primary and secondary damage. Localization and generalization of damage; local and general reactions to damage, their relationship. Leading links of pathogenesis and «vicious circles», trace reaction.

The system principle in pathology. The concept of pathological system (G.N. Kryzhanovskii), its distinctive identity, role in the disease development.

Protective and compensatory response. The similarities and differences between the concepts of adaptation and compensation. Emergency and long-term of adaptation and compensation reactions, their mechanisms, role in the disease development. The role of the genetic apparatus in the formation of long-term reactions of adaptation and compensation. Pathophysiological «price» adaptation and compensation. Mechanisms for recovery. The phenomenon of decompensation. Pathogenic principles of disease treatment.

1.2. Pathogenic influence of environmental factors on the human body

Characterization of the physical factors pathogenic effects: mechanical damages, hypo - and hyperkinesia, hypo - and hyperthermia, burn disease. The weather factors, the consequence of their impact (mountain disease, the bends). The electric current and the peculiarities of its damaging effect on the body. The damaging effect on the organism of ionizing radiation. The forms and stages of radiation sickness. Long-term effects of ionizing radiations. Pathogenic action of chemical factors; exo - and endogenous intoxication.

Biological factors. Viruses, bacteria, and parasites as causes of infectious diseases. Psychogenic pathogenic factors; the concept of iatrogenic diseases. The importance of social factors in preservation of health and the occurring of human diseases. Environmental aspects of General pathology.

Causal principle of diseases prevention and treatment.

Critical analysis of some General nosology concepts of (monocausalism, conditionalism, constitutionalism and others).

1.3. The role of the reactivity, constitution and age in pathology

The reactivity of the organism, its types, indexes and evolutionary aspects. Reactivity and resistance. Factors determining reactivity. The role of genotype, age, sex, congenital and acquired properties, individual peculiarities of the organism. The role of reactivity in the infectious process development. Specific and nonspecific protective factors.

The influence of environmental factors on the organism reactivity: the role of social and environmental factors. Pathological reactivity, its types and forms of manifestation. The directional change of individual and group reactivity as the major

means of diseases prevention and treatment. Factors that reduce nonspecific resistance. Ways and means of its improvement.

The doctrine of the constitution. Classification of constitutional types. The value in pathology.

The reasons and mechanisms of aging. Peculiarities of manifestations and course of the disease in elderly and senile age.

Immunogenic reactivity and basic forms of its violations. Immunodeficiency: primary (hereditary) and secondary (acquired) in infectious diseases, radiation injuries, protein starvation, intoxication, alcoholism, cancer, aging and other; iatrogenic immunodeficiency states.

Allergy. Definition and general characteristics of allergies. Allergies and immune system, allergies and inflammation. Exo- and endogenous allergens; their types. The value of hereditary predisposition to allergies. Types of allergic reactions, their classification. Autoallergic (autoimmune) diseases. The etiology and pathogenesis. Primary and secondary autoallergens, comprehensive autoallergens. Disorders of the immune system as the basis of autoallergy. Principles of revealing and treatment of autoimmune diseases.

1.4. The role of heredity in pathology

Hereditary and congenital diseases. Phenocopies. Etiology of hereditary diseases. Mutagenesis mutation; their varieties. Mutagenic factors; the value of ionizing radiation, viruses and environmental pollution in causing mutations; the possibility of drug mutations. The role of the conditions and the reactivity of the organism in the appearance of hereditary diseases.

Mechanisms of hereditary pathology: loss of normal hereditary information; excess of hereditary information; its replacement by a pathological; violations of regulation of the genetic apparatus activity; untimely realization of genetic information. Violation of DNA repair processes. The role of violations of the repair system and «immune surveillance» in the appearance of hereditary pathology; the role of mobile genes. Genetic, enzyme, receptor and metabolic blocks as the basis of the hereditary diseases pathogenesis.

Mono - and polygenic hereditary diseases. Penetrance and expressiveness. Chromosomal diseases. Hereditary predisposition to disease. The value of heredity in the multifactorial diseases development.

Hereditary diseases of connective tissue.

Methods of hereditary diseases studying, principles of their prevention and possible treatments. The paramount importance of environmental protection. The concept of gene therapy and «genetic engineering»; their prospects in medicine. Antimutagens. Mutagenic factors, mechanisms of their action.

Pathology of fetal development. The concept of antenatal pathology. Gametopathy, blastopathy, embryopathy, fetopathy. Dead fertility, its etiology. The value of the critical (sensitive) periods in the pathology of the embryo and fetus. Communication fetus pathology with harmful effects on the mother's body.

Anomalies of dental system, individual teeth, dentition, occlusion, deformation of the jaws (prognatiya, micrognathia, proginiya).

2. Typical pathological processes

2.1. Disorders of peripheral circulation and microcirculation

General hemodynamic bases of local peripheral circulatory disorders. Basic forms of local circulatory disorders: arterial hyperemia, venous congestion, ischemia, stasis. Their types, causes and mechanisms of development, symptoms. Microcirculation in different types of local circulatory disorders. Ratio of violations of macro-and microcirculation. Changes in the tissues of patients with arterial and venous congestion, ischemia, stasis; their significance and possible consequences. General changes in the body at the local circulatory disorders. Postischemic reperfusion syndrome. Compensatory processes (shunting blood flow, collateral circulation).

Thrombosis and embolism as particular causes of local blood flow disturbance. Causes and conditions of thrombosis. Stages and mechanisms of the process of thrombus formation; types of blood clots. Causes and mechanisms of emboli formation; types of emboli. Value, outcomes and consequences of thrombosis and embolism. Ways of prevention and therapy.

Typical microcirculatory disorders. Changes in blood flow and its rheological properties, the walls of microvessels and perivascular tissue; their relationship. Causes and mechanisms of microcirculatory disorders. Hemoconcentration, violation of suspension stability, aggregation and agglutination of red blood cells, «sludge»-phenomenon. Platelet aggregation. Capillary (veritable) stasis.

Disturbances of tone, mechanical integrity, structure, physical and mechanical properties and microvascular permeability. Accumulation in the perivascular space of physiologically active substances, ions, liquid.

Capillary-trophic failure.

Typical violations of lymphodynamics. Mechanical, dynamic and functional resorptive failure of lymphatic vessels.

2.2. Cell Injury

Injury. Definition and characterization of concept. Exogenous and endogenous causes of cell injury. The concept of cells self-harm. The role of immune processes in the cells self-harm, as well as their long inactivity, aging, disorders of the nervous system trophic function.

Common mechanisms of cell injury and manifestation. Direct and indirect effects on the cell damaging agent. Character arising violations; their specificity. Violations of energy production, transport mechanisms and utilization of energy in the cell. Violations of the permeability and transport functions of cell membranes and cell organelles. Changes in the activity of intracellular enzymes; output of organelles and enzymes from the damaged cells. An imbalance in ion and fluid cell.

Role of free radicals in pathological processes development. Damaging effects of active oxygen species and peroxidation products (free-radical) of lipids. Changes in the balance of the cell pro-and antioxidant systems, as one of the typical mechanisms of free radical's pathogenic action. Violations of the structure and functions of individual cell organelles, cell function regulation mechanisms. Changes in receptor properties of cells. Violations of the genetic apparatus and mechanisms of the genetic program realization.

Violation of damaged cells functions and interaction. Reversible and irreversible injury. Manifestation of cell injury, cell dystrophy and dysplasia. Necrosis and autolysis as outcomes of injury.

Cellular mechanisms of compensation at damage. Microsomal detoxification system, buffer systems, cellular antioxidants, anti-mutagenic system. Adaptive changes in the functional activity of the cell and its genetic apparatus. Cellular and subcellular regeneration. Ways to improve the resistance of cells to the action of pathogenic factors and stimulate recovery processes in damaged cells.

2.3. Inflammation

Definition. Local and general signs of inflammation. The etiology of inflammation. Acute inflammation. The main components of the inflammatory process: alteration, changes in blood circulation with exudation and emigration of leukocytes, proliferation.

Primary and secondary alteration at an inflammation. Changes in metabolism, permeability of cell membranes and cell organelles in inflammation site, mechanisms of their development and significance. Mediators of inflammation; their origin classification principles and their role in the inflammatory process, in the development of secondary alteration. The concept of pro-and anti-inflammatory mediators. Interrelation of various mediators.

Reactions of microvascular vessels. Changes in blood flow, their stages and mechanisms. Changes in blood rheology in inflammation site, protein composition and physic-chemical properties of the plasma proteins. Changes in microvascular permeability.

Exudation. Enhancing filtration, diffusion and microvesicles formation as a basis of exudation process. Mechanisms and significance of exudation in inflammation site. Types of exudates.

Marginal position and emigration of leukocytes in inflammation site, their mechanisms.

Phagocytosis; its types, stages, mechanisms and biological significance. Violation of phagocytosis; its causes and significance at an inflammation. Hereditary diseases of phagocytic system. Proliferation, its main manifestations and mechanisms of development.

Reactivity role in the development of inflammation. Communication of local and general phenomena in inflammation. Meaning of endogenous pro-and anti-inflammatory factors, nervous, endocrine and immune systems in the inflammatory process. Inflammation and allergy. Types of inflammation.

Chronic inflammation, patterns of development. Pathogenic features of acute and chronic inflammation.

Dialectical relationship of damage and protective-adaptive reactions in the inflammatory process. Outcomes of inflammation. Value of an inflammation to the body. Basic theory of the inflammation pathogenesis. The principles of anti-inflammatory therapy.

Inflammatory diseases of the maxillofacial region. Features of occurrence and current of inflammatory reaction in the tissues of oral cavity.

2.4. Pathophysiology of thermoregulation. Fever and hyperthermia

Definition and general characteristics of fever. Etiology of fever. Infectious and non-infectious fever. Pyrogenic substances: primary and secondary, exogenous and endogenous, their chemical nature and the sources of formation at infection process, aseptic tissue damage and immune reactions. Mechanisms of realization of pyrogens actions. Mediators of fever. Stages of fever. Thermoregulation at different stages of fever.

Meaning of thermosensitive zones of the hypothalamus and peripheral receptors in restructuring of thermoregulation at a fever. Types of febrile reactions. Dependence of fever development on the properties of the pyrogenic factor and organism reactivity. Temperature curves, their diagnostic value.

Participation of the nervous, endocrine and immune systems in the development of fever. Changes in metabolism and physiological functions at a fever. Meaning of febrile response to the organism. Features of febrile response in the neonatal period and in elderly patients. Principles of analgesic therapy. Concept of pyrotherapy.

Difference between fever and exogenous overheating and other types of hyperthermia.

Changes in the salivary glands function and oral cavity in fever.

2.5. Typical metabolic disorders

Carbohydrate metabolism disturbances. Violations of carbohydrate foods suction, the processes of synthesis, deposition and glycogen disintegration, transport of carbohydrate into cells and digestion of carbohydrates. Hypoglycemia, types and mechanisms of origin. Hyperglycemia. Diabetes mellitus and its types.

The etiology and pathogenesis of various diabetes types. The mechanisms of insulin resistance. Disorders of carbohydrate and other kinds of metabolism at diabetes; disorders of physiological functions, complications; their mechanisms. Diabetic coma. Carbohydrate metabolism disturbances in hereditary enzymopathies. Violations of protein metabolism. Positive and negative nitrogen balance. Violations of protein metabolism final stages, urea synthesis. Hyperasotemia. Violations of the blood plasma protein composition: hyper-, hypo- and dysproteinemia.

Disorders of purine and pyrimidine bases metabolism. The role of exogenous and endogenous factors in the development of gout. Lipid metabolism disorders. Primary and secondary dyslipidemia. General obesity; its types and mechanisms. Violation of phospholipids metabolism. Hyperketonemia. Violation of cholesterol metabolism; hypercholesterolemia. Atherosclerosis and its pathogenic mechanisms and negative effects.

Starvation. Exogenous and endogenous causes of starvation. Absolute, complete, incomplete, partial starvation; protein starvation. Protein-energy (protein-energy) deficiency, its types: alimentary marasmus, Kwashiorkor-disease, alimentary dystrophy. Periods of complete starvation; changes in metabolism and physiological functions in different periods of complete starvation. Concept of medical starvation.

Typical metabolic disorders as risk factors for main noninfectious diseases (cardiovascular disease, cancer, diabetes). Disorders of water metabolism. Hyper-, iso- and hypoosmolar dehydration. Hyper-, iso- and hypoosmolar hypohydration.

Edema. Pathogenic factors of edema; value of hydrodynamic, osmotic and oncotic pressure gradients in the blood and tissues, state of vascular tissue membranes. The role of neuro-hormonal mechanisms in the development of edema. Types of edema. Pathogenesis of cardiac, renal, inflammatory, allergic, hungry edema. Local and general edema violations, the principles of their therapy, experimental models.

Violations of electrolyte metabolism. Violation of the content and ratio of sodium, potassium, calcium, magnesium ions and microelements in body fluids between cellular and extracellular sectors. The underlying causes and mechanisms of electrolyte imbalance. The relationship between water, ion and acid-base balance. Disorders of metabolism and physiological functions in the most frequent forms of electrolyte imbalance.

Disturbances of acid-base status. Classification of the main types of violations of the acid-base status of internal environment of the body. Gas (respiratory) acidosis and alkalosis. Non-gas forms of acidosis and alkalosis: metabolic, excretory (renal and gastro), exogenous. Mixed forms. Compensatory reactions in acute and chronic disorders of acid-base balance. Changes of acid-base balance parameters in the body at different types of acidosis and alkalosis. Principles of correction.

2.6. Hypoxia

Definition of hypoxia as the state of absolute or relative biological oxidation deficiency. The role of hypoxia in the pathogenesis of various diseases and pathological processes. Stability of individual organs and tissues to oxygen starvation. Principles of hypoxia classification. Types of hypoxia. Etiology and pathogenesis of hypoxia major types: hypoxic, hyperoxic, respiratory, circulatory, hemic, tissue, mixed origin. Hypoxia during uncoupling of oxidation and phosphorylation, overload hypoxia. Hypoxia as consequence of oxidation substrates deficit. Mixed forms of hypoxia. Laboratory parameters of gas composition of arterial and venous blood at certain types of hypoxia.

Emergency and long-term reactions of adjustment and compensation during hypoxia; their mechanisms.

Urgent and long-term reactions of adjustment and compensation during hypoxia; their mechanisms.

Violation of metabolism, structure and function of cells and physiological functions at acute and chronic hypoxia. Reversibility of hypoxic conditions. Influence of hyper- and hypocapnia on the development of hypoxia.

Pathophysiological bases of hypoxic conditions prevention and treatment. Experimental models of various types of hypoxia. Mechanisms of adaptation and compensation. Protective effects of adaptation to hypoxia. Local hypoxia in the pathogenesis of inflammatory and dystrophic lesions of the maxillofacial area tissue.

Hyperoxia: definition and its role in pathology. The therapeutic effect of hyperoxia: hyperbaric oxygen therapy and its application in dentistry.

2.7. Tumor growth

Definitions of «tumor growth» and «tumor». Spread of tumors in nature, phylogenesis and ontogenesis.

Etiology of tumors; physical and chemical blastomogenic factors, biological carcinogens.

Chemical carcinogenic factors, their classification, procarcinogens and the final (true) carcinogens. Cocarcinogens and sincarcinogens. Stages of chemical carcinogenesis.

Physical carcinogenic factors. Ionizing radiation as a blastomogenic factor. The role of ionizing radiation, radioactive isotopes, ultraviolet rays, X-rays, thermal and mechanical factors. Stages of physical carcinogenesis. Carcinogens of biological nature. Types of oncogenic viruses. Stages of viral carcinogenesis. The importance of hereditary factors, gender, age, chronic diseases in the appearance of tumors in humans.

Biological features of tumor growth relative autonomy and unregulated tumor growth, simplification of structural chemical organization (atypism, its types), the tumors and embryonic tissues similarities and differences. Metastasis (the definition, stage, mechanisms). Recurrence of tumors.

Malignant and benign tumors, peculiarities of their growth. Metabolic, functional and antigenic properties of malignant cells. Features and mechanisms of the invasive and destructive growth. Tumor progression.

Theory of the tumors pathogenesis. Modern ideas about the molecular and genetic mechanisms of carcinogenesis. The concept about the cellular proto-oncogenes and anti-oncogenes and their role in oncogenesis. Mechanisms of proto-oncogene transformation in active oncogene. Nature of oncoproteins and possible mechanisms of action. The role of mutation, epigenetic, virus-genetic mechanisms in carcinogenesis. Precancerous conditions.

Antineoplastic body resistance, immune and non-immune factors of resistance. Depression antineoplastic resistance value in the occurrence and development of tumors. The tumor and the body interaction. Role and reaction of the nervous and endocrine systems. Systemic manifestations of neoplastic disease. Cancer cachexia.

Pathophysiological bases for prevention and therapy of tumors.

3. Pathophysiology of the organs and systems

3.1. Pathophysiology of the blood system

Changes of total blood volume: hypo- and hypervolemia, their types, causes mechanisms and value for the organism. Acute hemorrhage as the most common cause of hypovolemia. Emergency and long-term protective and adaptive reactions of the organism at blood loss: the restoration of the blood volume, plasma proteins and formed elements. Disorders of physiological functions at blood loss and during postgemorrhagic states; reversible and irreversible changes. Principles of hemorrhage therapy.

Anemias and erythrocytoses, definition of notions, principles of classification by: the etiology and pathogenesis, hematosi type, the color index, regenerative ability of bone marrow, the size and shape of red blood cells. Iron deficiency anemia. Anemia with a deficiency of vitamin B₁₂ and folic acid (megaloblastic anemia), erythropoietin deficiency and other erythropoiesis factors. Achrestic anemias.

Anemias due to suppression of erythropoiesis by toxic effects, ionizing radiation and during autoimmune processes. Hypo- and aplastic anemias. Anemia at leukemia and other tumors of the bone marrow.

Anemia due to the enhanced hemolysis. Hereditary hemolytic anemias (erythrocytopathies, erythroenzymopathies, hemoglobinopathies). Acquired hemolytic anemias. Role of autoimmune processes in the pathogenesis of anemias.

Acute and chronic hemorrhagic anemias.

Polycythemias: primary (erythremias) and secondary (absolute and relative erythrocytosis).

Violations and compensatory-adaptive processes in the body with anemia and polycythemia.

Disruption of the structure and function of the individual types of leukocytes and their role in pathological processes. Leukocytosis, leukopenia, agranulocytosis, their types, causes and mechanisms of development. Changes in leukocyte formula. Panmyelophthisis.

Concept of hemoblastoses. Leukemias. Definition, general characteristics, principles of classification. Tumor nature of leukemias, the role of abnormal expression of oncogenes. The etiology of leukemias, the role of viruses, chemical carcinogens, ionizing radiation. Features of leukemic cells, their morphological, cytochemical, cytogenetic and immunological characteristics. Hematopoiesis features and peripheral blood cell composition during different types of leukemias. Principal disturbances in the body with leukemia, their mechanisms. Principles of diagnosis and therapy of leukemias.

Leukemoid reactions. Types of leukemoid reactions, their etiology, pathogenesis, hematopoiesis and morphological changes of the peripheral blood, the difference from leukemia and value for the organism.

Violations of the hemostatic system. Thrombocytosis, thrombocytopenia, thrombocytopathy. Hemorrhagic and thrombotic syndromes. Hereditary and acquired forms of violation of vascular-platelet hemostasis and coagulation hemostasis.

The oral cavity changes in the pathology of the blood (anemia, leukemia).

3.2. Pathophysiology of the cardio-vascular system

General etiology and pathogenesis of the circulatory system functions disorders. Risk factors in the occurrence of cardiovascular disease: managed and unmanaged. Value of psycho-emotional factors. The notion of circulatory failure, it forms the basic hemodynamic parameters and manifestations.

Heart failure, its kinds. Overload form of heart failure. Overloading by blood volume and blood pressure in the cavity of the heart, the etiology and pathogenesis. The concept of the systolic and diastolic failure. Myocardial form of heart failure, its causes and mechanisms.

Short-term and long-term intracardiac compensation mechanisms of heart failure. Myocardial hypertrophy, peculiarity of the hypertrophied heart, the mechanisms of its decompensation.

Extracardiac compensation mechanisms of heart failure. Effects and pathogenic evaluation of extracardiac compensation mechanisms.

General and hemodynamic manifestations of heart failure. Basic clinical syndromes during heart failure: small cardiac output syndrome, congestion on the ways of inflow to the weakened heart area syndrome. Principles of treatment and prevention of heart failure.

Coronary insufficiency, absolute and relative. Pathogenesis of ischemic coronary insufficiency syndrome. Clinical forms of coronary insufficiency. Coronary heart disease, its forms, causes and mechanisms of development. Stenocardia. Myocardial infarction, metabolic disorders, electrogenic and contractile properties of the myocardium in the ischemic area and beyond. Complications and outcomes of stenocardia and myocardial infarction. Restoring blood flow to the ischemic area. Pathogenesis and clinical manifestations of myocardial reperfusion injury. Noncoronary form of heart damage.

Myocardial damage during systemic diseases (diabetes mellitus, beriberi, obesity, endocrine disorders, collagenoses).

Cardiac arrhythmias. Types, causes, mechanisms, signs on the electrocardiogram. Disorders of systemic and coronary circulation during cardiac arrhythmias.

Arterial hypertension. Primary (essential) arterial hypertension, its etiology, pathogenesis theories, stabilizing factors of high blood pressure. Secondary («symptomatic») arterial hypertension, types, causes and mechanisms of development. Hemodynamics at different types of arterial hypertension. Complications and consequences of arterial hypertension. Target organ damage during arterial hypertension. Experimental models of arterial hypertension.

Arterial hypotension. Types, causes and mechanisms of development. Essential arterial hypotension.

Atherosclerosis: the causes, mechanisms of development. Risk factors (the role of psychoneurogenic and hereditary factors, nutrition and hypodynamia). Relationship of arterial hypertension and atherosclerosis. Role of atherosclerosis in the cardiovascular system pathology.

Signs of the cardiovascular system chronic failure identified in the oral cavity.

3.3. Pathophysiology of the external respiration

Etiology and pathogenesis of external respiration disorders. Concept of respiratory failure, its stages and manifestations. Shortness of breath, its types, mechanisms of development.

Alveolar hypoventilation. Obstructive and restrictive types of ventilation disorders, their causes and mechanisms. Upper airway obstruction. Acute mechanical asphyxia, causes and mechanisms of development. Obstruction of the lower respiratory tract: pathogenesis of bronchial and emphysematous types of obstruction. Dysregulation of breathing. Reflex respiratory disorders, lesions of the respiratory center. Pathological forms of breathing. Respiratory arrhythmia, periodic breathing, terminal breathing, apnea.

Disorders of pulmonary blood flow, their causes and consequences. General pulmonary perfusion failure. Pulmonary hypertension, pre- and post-capillary form. Local irregularity of ventilation-perfusion relationships.

Violations of blood-air diffusion. Their causes and consequences. Mixed forms of external respiration violations. Etiology and pathogenesis of acute respiratory failure at respiratory distress syndrome of adults and newborns.

Compensatory-adaptive processes in the system of external respiration in case of its individual unit's damage. Alveolar hyperventilation: its causes, mechanisms

and consequences. Changes in ventilation rate, blood gas and acid-base status at respiratory failure and hyperventilation.

Pathophysiological principles of respiratory failure prevention and treatment. Importance of protecting the purity of air and the fight against smoking for prevention of external respiration diseases.

3.4. Pathophysiology of the digestive system

General etiology and pathogenesis of the digestive system disorders. The role of food and nutrition. Significance of neurogenic and humoral factors. Pathogenic effects of smoking and alcohol. Functional relationships of the digestive system different parts in pathological conditions. Digestive disorders during metabolic disorders.

Appetite disorders: hyporexia, anorexia, parorexia, bulimia, polyphagia, polydipsia, disorders of taste sensations. Violations of salivation, hypo- and hypersalivation. Violations of mastication, swallowing and esophageal function.

Violations of the reservoir, the secretory and motor functions of the stomach. Types of pathological secretion. Hypo- and hyperkinetic stomach conditions. Violations of gastric contents evacuation: belching, heartburn, nausea, and vomiting. Relationship of secretory and motor disorders. Disorders of the small intestine and colon. Violations of secretory function. Meaning damage enterocytes, pancreatic achylia, acholia; role of gastrointestinal hormones. Violations of the cavernous and parietal digestion; malabsorption. Intestinal dysmotility. Diarrhea, constipation, intestinal obstruction. Violations of the intestinal barrier function; Coli-septicemia and dysbacterioses. Enteritis, colitis. Peptic ulcer and symptomatic ulcers of the stomach and duodenum.

Violations of the pancreas secretory function; acute and chronic pancreatitis.

Pathophysiology of certain diseases of the oral cavity and dentoalveolar apparatus. Dental caries (etiology and pathogenesis). Periodontal disease. Role of neurogenic dystrophy and autoimmune reactions in the pathogenesis of periodontal disease. Modern understanding of the development mechanisms. Role of dentoalveolar apparatus (chewing) violations in disorders of the gastrointestinal tract. The role of salivary gland pathology in disorders of the gastrointestinal tract.

3.5. Pathophysiology of the liver

General etiology and pathogenesis of the liver diseases. Violations of the portal circulation, the arterial blood supply of the liver. Parenchymal liver damage: inflammatory (acute and chronic hepatitis), dystrophic, cholangiostatic. Cirrhosis of the liver. Violations of biliary excretion. The role of autoimmune mechanisms in the liver pathology.

Hepatic failure: cholestatic, hepatocellular, vascular, mixed. Manifestations of liver failure. Disorders of carbohydrate, protein, lipid, water-electronic exchange, the hormonal regulation of the composition and physico-chemical properties of the blood during hepatic failure. Abnormalities of the barrier and disintoxication liver function. Acute hepatic failure, hepatic coma.

Etiology and pathogenesis of hepatitis and liver cirrhosis. The main syndromes in liver pathology. Jaundice, their types: suprahepatic, liver, obstructive; their causes, mechanisms, manifestations.

Hematology, Endocrinology and Banti's syndromes. Portal hypertension syndrome. Pathogenic assessment of its symptoms.

Dystrophic, oncological and alcoholic liver diseases. The role of hepatotropic poisons in their pathogenesis. Ways to prevent liver diseases. Signs of liver disease identified in the oral cavity.

3.6. Pathophysiology of the kidneys

Common elements in the etiology and pathogenesis of different renal function impairments. Impairments of renal hemodynamics, urine flow, renal parenchymal; disorders of urine formation neuro-humoral regulation; renal enzymopathy. Violation mechanisms of glomerular filtration, proximal and distal tubular reabsorption, tubular secretion and excretion; mixed violations.

Manifestations of renal function disorders. Changes in diuresis and urine composition, polyuria, oliguria, anuria, hypo- and hypersthenuria, izostenuriya pathological urine components of renal and extrarenal origin. Changes in the composition and physico-chemical properties of blood. Manifestations of hereditary tubulopathy.

Concept of glomerulopathy. Diffuse glomerulonephritis; etiology, pathogenesis. Nephrotic syndrome. Acute and chronic renal failure. Etiology, pathogenesis, stages.

Concept of nephrolithiasis; etiological factors of stone formation.

Symptoms of chronic renal failure identified in the oral cavity.

3.7. Pathophysiology of the endocrine system

General etiology and pathogenesis of endocrine disorders. Violations of the central mechanisms of the endocrine glands regulation. Excess, deficiency and imbalance of releasing and inhibiting factors of the midbrain (liberines and statines); violation of feedback and self-regulation mechanisms in the neuroendocrine system, trans-, para-adenohypophysis mechanisms of regulatory disorders. Psychogenic endocrinopathies.

Primary disorders of hormone synthesis in peripheral endocrine glands as a consequence of pathological processes in the glandular tissue, depletion on the basis of long-term hyperfunction, deficiency of the necessary components for the synthesis of hormones; genetically determined defects in hormone biosynthesis. Iatrogenic endocrinopathies.

Peripheral (extraglandular) mechanisms of disorders violations of hormone effect realization: binding disorders and the «liberation» of hormones by blood proteins, blockade, excessive destruction and other metabolic disorders in tissues, absence or change in properties of hormone receptors in target cells.

The main types of endocrine disorders. Hypo-, hyper- and dysfunctional; mono- and pluriglandular; partial and total endocrinopathies; early and late; primary, secondary and tertiary; absolute, relative and relative-absolute forms.

General characteristics of detection methods and principles of endocrine disorder treatment. Endocrine disorder role in etiology and pathogenesis of non-endocrine diseases.

Typical forms of disorders of individual endocrine gland functions. Pathology of the hypothalamic-pituitary system. Hyperfunction and hypofunction of the anterior

pituitary gland. Hyper- and hypofunction of the posterior pituitary gland. Total failure of the pituitary gland.

Pathophysiology of the adrenal glands. Typical forms of disease (hypo- and hyperfunctional state), their manifestations.

Pathophysiology of the thyroid gland. Hypo- and hyperthyroidism, thyrotoxicosis.

Pathophysiology of parathyroid glands: hypoparathyroidism, hyperparathyroidism.

Pathophysiology of the gonads. Hypo- and hypergonadism in women and men.

Endocrine function of the pancreas.

Dyshormonal disorders of maternal organism, and their importance in the development of fetal endocrinopathy. The role of maternal antibodies transplacental transfer, endogenous and exogenous toxic substances in the pathogenesis of perinatal endocrinopathies.

3.8. Pathophysiology of the nervous system

General etiology of the nervous system disorders. Exogenous and endogenous etiological factors, the importance of social conditions. Primary and secondary disorders.

Neurons and pathways function impairment. Specific and nonspecific mechanisms. Abnormalities of synapse functions. Disorders of synaptic processes, their pre- and postsynaptic mechanisms. Forms of nervous system disorders (by the intensity of the operation and the adequacy of the nerve cell response). Typical pathological processes of the nervous system. Generators of pathological excitation, conditions of their formation, peculiarities of activity and pathogenic significance. Outcomes of pathological processes in the nervous system, trace reactions. Inhibition deficiency, abnormal hyperactivity of neuron. Denervation syndrome. Deafferentation of neural structures. Protective, adaptive and compensatory processes in the nervous system. Neurogenic disorders of sensation, their types and mechanisms.

Neurogenic disorders of the locomotor function, hypo- and hyperkinetic states, paresis and paralysis. Myasthenia. Convulsive state, its types and mechanisms. Dysfunctions of the autonomic nervous system, their types and mechanisms, the concept of vegetative dystonia.

Neural disorders of trophism. Neurodystrophic process. Denervation trophic disorders. Metabolic, functional and structural manifestations of neurodystrophy. Pain and its role in pathology.

Disorders of higher nervous activity. Classification. Neuroses. Definition and general characteristics. Biological and social aspects of neuroses. Experimental models of neuroses. Neurophysiological mechanisms of neuroses. The main manifestations of neurosis.

ACADEMIC DISCIPLINE CURRICULAR CHART

Section, topic #	Section (topic) name	Number of hours			Self-studies	Form of control
		lectures	supervised student work	practical		
	4 semester	10	2,5	48	60	
1.	GENERAL NOSOLOGY	2	0,5	18	22	
1.1.	Introduction to the discipline «Pathological physiology». General questions of the doctrine of a disease. General etiology and pathogenesis	2	0,5	6	8	
	Introduction to the discipline «Pathological physiology». Subject, tasks, methods of pathological physiology	1	0,5	3	5	Discussion, control work, written reports on practical work, electronic tests
	General questions of the doctrine of the disease. General etiology and pathogenesis	1	-	3	3	Discussion, control work, written reports on practical work, electronic tests
1.2.	Pathogenic influence of environmental factors on the human body	-	-	6	8	
	The effect of electric current on the body	-	-	3	4	Discussion, control work, written reports on practical work, electronic tests
	The damaging effect of ionizing radiation	-	-	3	4	Discussion, control work, written reports on practical work, electronic tests
1.3.	The role of reactivity, constitution, age and heredity in pathology development	-	-	3	3	Discussion, tests, written reports on practical work
1.4.	Final lesson on the section «General Nosology». Colloquium	-	-	3	3	Discussion, electronic tests, colloquium

2. TYPICAL PATHOLOGICAL PROCESSES		8	2	30	38
2.1.	Pathophysiology of regional blood circulation and microcirculation	-	-	6	6
	Pathological physiology of regional circulation and microcirculation. Arterial and venous hyperemia, ischemia, stasis	-	-	3	3
	Pathological physiology of regional circulation and microcirculation. Thrombosis, embolism, microcirculation disorders	-	-	3	3
2.2.	Pathophysiology of cell. Inflammation	4	1	6	10
2.3.	Cell Injury (lecture)	2	0,5	-	2
	Inflammation (lecture)	2	0,5	-	2
	Pathophysiology of the cell. Cell injury. General cell injury mechanisms. Inflammation. Vascular reaction in the focus of inflammation	-	-	6	3
	Inflammation. Phagocytic reaction in the focus of inflammation	-	-	3	3
2.4.	Pathology of thermoregulation. Fever	2	0,5	3	4
	Fever (lecture)	2	0,5	-	1
	Pathology of thermoregulation. Fever	-	-	3	3
2.5.	Typical metabolic disorders	-	-	6	6
	Typical violation of metabolism. Acid-base balance impairments	-	-	3	3
	Typical metabolic disorders. Pathological physiology of water metabolism. Swelling and dropsy	-	-	3	3
2.6.	Hypoxia	-	-	3	3
2.7.	Pathophysiology of tissue growth	2	0,5	3	4
	Pathophysiology of tumor growth (lecture)	2	0,5	-	2
					Discussion, written reports on practical work, electronic tests
					Discussion, written reports on practical work, electronic tests
					Discussion, control work, written reports on practical work, electronic tests
					Discussion
					Discussion, written reports on practical work, electronic tests
					Discussion, written reports on practical work, electronic tests
					Discussion, tests
					Discussion

	Pathophysiology of tissue growth. Etiology of tumors. Mechanisms of carcinogenesis	-	-	3	2	Discussion, written reports on practical work, electronic tests.
	Colloquium on the section «Typical Pathological Processes»	-	-	3	5	Reports at practical classes. Colloquia Credit
	5 semester					
3.	Pathophysiology of organs and systems	14	5,5	32	46	
	Pathophysiology of the blood system	-	-	14	15	
3.1.	Pathophysiology of the blood system. Changes in the total blood volume: hypo- and hypervolemia. Acute blood loss	-	-	2	2	Discussion, written reports on practical work, electronic tests.
	Pathological physiology of the blood system. Typical forms of pathology and reactive changes in the erythrocyte system. Anemia. Erythrocytosis.	-	-	2	2	Discussion, written reports on practical work, electronic tests
	Pathological physiology of the blood system. Typical forms of pathology and reactive changes in the leukocyte system. Leukocytosis, leukopenia and agranulocytosis	-	-	2	2	Discussion, written reports on practical work, electronic tests.
	Pathological physiology of the blood system. Hemoblastosis. Leukemoid reactions	-	-	2	2	Discussion, written reports on practical work, electronic tests.
	Pathological physiology of the blood system. Hemostasis disorders	-	-	2	2	Discussion, written reports on practical work, electronic tests.
	Pathological physiology of the blood system. Improvement of practical skills (pathophysiological analysis of hemograms)	-	-	2	2	Discussion, solving situational problems based on clinical cases.
	The final session on «Pathology of Blood System». Colloquium	-	-	2	3	Discussion. Control work.
3.2.	Pathophysiology of the circulatory system	4	1,5	6	12	
	Pathophysiology of the circulatory system. Heart failure (lecture)	2	0,5	-	1	Discussion.

	Pathophysiology of the circulatory system. Heart failure, its types. Overload and myocardial forms of the heart failure	-	-	2	3	Discussion, written reports on practical work, solving situational problems based on clinical cases, electronic tests.
	Pathophysiology of the circulatory system. Heart rate disorders (arrhythmias), types, causes, mechanisms	-	-	2	3	Discussion, written reports on practical work, electronic tests.
	Arterial hypertension and hypotension (lecture)	2	1	-	2	
	Pathophysiology of the circulatory system. Violations of the regulation of vascular tone. Arterial hypertension and hypotension. Types, etiology and pathogenesis. Colloquium on section «Pathophysiology of the cardiovascular system»	-	-	2	3	Discussion. Control work.
3.3.	Pathological physiology of the external respiration	2	0,5	2	3	Discussion, written reports on practical work, solving situational problems based on clinical cases, electronic tests.
3.4.	Pathological physiology of digestion	2	0,5	4	7	
3.5.	Pathological physiology of liver	2	0,5	-	2	
	Pathological physiology of digestion and liver (lecture)					
	Pathological physiology of digestion	-	-	2	2	Discussion, written reports on practical work, solving situational problems based on clinical cases, electronic tests.
	Pathological physiology liver	-	-	2	3	Discussion, written reports on practical work, solving situational problems based on clinical cases, electronic tests.
3.6.	Pathological physiology of the kidneys	2	1	2	3	Discussion, written reports on practical work, solving situational problems based on clinical cases, electronic tests.
3.7.	Pathological physiology of the endocrine system	2	1	2	2	Discussion, written reports on practical work, solving situational problems based on clinical cases, electronic tests.

3.8.	Pathological physiology of the nervous system	2	1	2	3	Discussion, written reports in practical work, solving situational problems based on clinical cases, electronic tests. Exam
Total hours		24	8	80	104	

INFORMATION AND INSTRUCTIONAL UNIT

LITERATURE

Basic (relevant):

1. Pathophysiology : textbook for students of higher medical educational institutions of the III-IV accreditation levels / N. V. Krishtal [et al.]; ed. by.: N. V. Krishtal, V. A. Mikhnev. - Kyiv: AUS Medicine Publishing, 2017. - 656 p.

Additional:

2. General and clinical pathophysiology : textbook for students of higher educational institutions, of IV th level of accreditation / A. V. Kubyshkin [et al.]; ed. by. A. V. Kubyshkin, A. I. Gozhenko.- Vinnytsya : Nova Knyha.

3. Pathophysiology : textbook for students / P. F. Litvitsky, S. V. Pirozhkov, E. B. Tezиков. – Moscow : Geotar-Media, 2016. – 432 p.

4. Kumar, V. Robbins and Cotran Pathologic Basis of Disease. V. II / V. Kumar, A. K. Abbas, J. C. Aster. - South Asia ed. - India : Elsevier, 2015. - 1391 p.

5. Simeonova, N. K. Pathophysiology : textbook for students of higher medical educational institutions of the III-IV accreditation levels / N. K. Simeonova ; ed. by. V. A. Mikhnev. – Kyiv : AUS Medicine Publishing, 2015. - 544 p.

6. McPhee, Stephen J. Pathophysiology of Disease An Introduction to Clinical Medicine [Electronic resource] : textbook / Stephen J. McPhee. – NY : Appleton & Lange, 2014. - 832 p.

METHODOLOGICAL RECOMMENDATIONS FOR THE ORGANIZATION AND PERFORMANCE OF STUDENT INDEPENDENT WORK IN THE ACADEMIC DISCIPLINE

The time allocated for independent work can be used by students for:
preparation for practical classes;
preparation for tests and exams in the academic discipline;
study of topics (issues) submitted for independent study;
problem solving;
preparation of thematic reports, abstracts, presentations;
performing practical tasks.

METHODOLOGICAL RECOMMENDATIONS FOR THE ORGANIZATION AND PERFORMANCE OF SUPERVISED STUDENT INDEPENDENT WORK IN THE ACADEMIC DISCIPLINE

Main forms of supervised student independent work:
writing and presentation of an abstract;
giving a report;
studying the topics and problems that are not covered in lectures;
computer testing;
preparation and participation in active forms of learning.

Control of supervised student independent work is carried out in the form of:
final lesson, colloquium in the form of an oral interview, written work, testing;

discussion of abstracts;
 protection of educational tasks;
 assessment of an oral answer to a question, message, report or problem solution;
 checking of abstracts, written reports, reports, recipes;
 individual conversation.

LIST OF AVAILABLE DIAGNOSTIC TOOLS

The following forms are used to diagnose competencies:

Oral form:

discussions;
 colloquia;
 reports at practical classes;
 credit;
 exam.

Written form:

tests;
 control work;
 written reports on practical work;
 abstracts.

Oral and written form:

reports at classroom practical classes with their oral defense;
 solving situational problems based on clinical cases.

Technical form:

electronic tests;
 electronic workshops.

LIST OF AVAILABLE TEACHING METHODS

Traditional method (lecture, laboratory practicals);

Active (interactive) methods:

- Problem-Based Learning (PBL);
- Case-Based Learning (CBL).

LIST OF PRACTICAL SKILLS

1. Pathogenic analysis of hemograms of patients with various forms of pathology of the blood system, formulation of the conclusion.
2. Pathophysiological analysis of indicators of the acid-base state with the formulation of a conclusion about the causes, mechanisms of development, the degree of compensation for typical forms of disorders.

3. Pathophysiological analysis of clinical and laboratory data, formulation on their basis of a conclusion about the possible causes and mechanisms for the development of pathology of organs and systems of the human body.

4. Recognition of typical forms of cardiac arrhythmias according to electrocardiography data.

LIST OF LECTURES

4th semester

1. Introduction to the discipline «Pathological Physiology». General questions of the doctrine of the disease.

2. Cell damage.

3. Inflammation.

4. Fever.

5. Tumor growth.

5th semester

1. Pathological physiology of the cardiovascular system. Heart failure.

2. Arterial hyper- and hypotension.

3. Pathological physiology of the external respiration system.

4. Pathological physiology of digestion and liver.

5. Pathological physiology of the kidneys.

6. Pathological physiology of the endocrine system.

7. Pathological physiology of the nervous system.

LIST OF PRACTICAL STUDIES

4th semester

1. Introduction to the discipline «Pathological physiology». Subject, tasks, methods of pathological physiology.

2. General questions of the doctrine of the disease. General etiology and pathogenesis.

3. Pathogenic effect of environmental factors on the human body. The effect of electric current on the body.

4. Pathogenic effect of environmental factors on the human body. The damaging effects of ionizing radiation to the body.

5. The role of reactivity, constitution and age in the development of pathology.

6. The role of heredity in the development of pathology.

7. Pathophysiology of regional blood circulation and microcirculation. Arterial and venous hyperemia. Ischemia. Stasis.

8. Pathophysiology of regional blood circulation and microcirculation. Thrombosis. Embolism. Microcirculatory Disorders.

9. Pathophysiology of the cell. Cell injury. General cell injury mechanisms. Inflammation. Vascular reaction in the focus of inflammation.

10. Inflammation. Phagocytic reaction in the focus of inflammation.

11. Pathology of thermoregulation. Fever and hyperthermia.

12. Typical violation of metabolism. Acid-base balance impairments.
13. Typical violation of metabolism. Pathological physiology of water metabolism. Swelling and dropsy.
14. Hypoxia.
15. Pathophysiology of tissue growth. Etiology of tumors. Mechanisms of carcinogenesis.

5th semester

1. Pathological physiology of the blood system. Changes in the total blood volume: hypo- and hypervolemia. Acute blood loss.
2. Pathological physiology of the blood system. Typical forms of pathology and reactive changes in the erythrocyte system. Anemia. Erythrocytosis.
3. Pathological physiology of the blood system. Typical forms of pathology and reactive changes in the leukocyte system. Leukocytosis, leukopenia and agranulocytosis.
4. Pathological physiology of the blood system. Hemoblastosis. Leukemoid reactions.
5. Pathological physiology of the blood system. Hemostasis disorders.
6. Pathological physiology of the blood system». Improvement of practical skills (pathophysiological analysis of hemograms).
7. Final Lesson on the topic «Pathophysiology of Blood System».
8. Pathological physiology of the cardiovascular system. Heart failure, its types. Overload and myocardial forms of the heart failure.
9. Pathological physiology of the cardiovascular system. Heart rate disorders (arrhythmias), types, causes, mechanisms.
10. Pathological physiology of the cardiovascular system. Violations of the regulation of vascular tone. Arterial hypertension and hypotension. Types, etiology and pathogenesis. Final Lesson on the section «Pathophysiology of the cardiovascular system».
11. Pathological physiology of the external respiration.
12. Pathological physiology of the digestive system.
13. Pathological physiology of liver.
14. Pathological physiology of kidneys.
15. Pathological physiology of the endocrine system.
16. Pathological physiology of the nervous system.

**PROTOCOL OF THE CURRICULUM APPROVAL
BY OTHER DEPARTMENTS**

Title of the discipline requiring approval	Department	Amendments to the curriculum in the academic discipline	Decision of the department, which designed the curriculum (date, protocol #)
1. Pediatrics	Propaedeutics of Childhood Diseases	Proposals to amend the content of the teaching curriculum – no	protocol # 4 of 14.11.2022
2. Infectious Diseases	Infectious Diseases	Proposals to amend the content of the teaching curriculum – no	protocol # 4 of 14.11.2022
3. Internal Diseases	Propaedeutics of Internal Diseases	Proposals to amend the content of the teaching curriculum – no	protocol # 4 of 14.11.2022
4. Forensic Medicine	Forensic Medicine	Proposals to amend the content of the teaching curriculum – no	protocol # 4 of 14.11.2022
5. Neurology and Neurosurgery	Nervous and Neurosurgical Diseases	Proposals to amend the content of the teaching curriculum – no	protocol # 4 of 14.11.2022
6. Clinical Pharmacology	Clinical Pharmacology	Proposals to amend the content of the teaching curriculum – no	protocol # 4 of 14.11.2022
7. Surgical Diseases	General Surgery	Proposals to amend the content of the teaching curriculum – no	protocol # 4 of 14.11.2022

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Curriculum content, composition and the accompanying documents comply with the established requirements.

Dean of the Medical Faculty for
International Students of the educational
institution «Belarusian State Medical
University»

15. 11. 2022



O.S.Ishutin

Methodologist of the educational
institution «Belarusian State Medical
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