Study program: Integrated academic studies of Medicine

Type and level of the study program: integrated academic studies

Course title: Physiology (M2-PHYS)

Teacher: Barak F. Oto, Drapšin P. Miodrag, Karaba Jakovljević I. Dea, Karan V. Vedrana, Klašnja V. Aleksandar, Naumović M. Nada, Popadić Gaćeša Ž. Jelena

Course status: compulsory

ECTS Credits: 20

Condition: Anatomy; Histology and embryology

Course aim

Basic goals of education in the field of physiologyare introducing students with basis of functioning of organs and systems of organs and aspects of their organisation in complex functional systems.

Expected outcome of the course: Introduction with basic mechanisms of functioning of different systems of organs and aspects of organisation of regulatory mechanisms of complex homeostatic parameters in the functional systems. Introduction with complex neural and humoral regulatory mechanisms of different functional systems.

Students need to learn basic principles and rules of laboratory usage and to get acquainted with principal laboratory procedures. Also, students will be trained to perform daily laboratory routines by themselves. Students will learn to use animal models and animal tissue for demonstration of physiological processes. Students will be trained in detail for sampling and preparation of body liquids (blood, urine) as well as with the methods of basic laboratory analysis used in daily practice (sedimentation, hematocrit, red blood and white blood cell count, white blood cell formula, time of bleeding and coagulation, general and chemical characteristics of urine). Student will learn basic electrophysiological methods (ECG, EEG, EMNG, EP), and will be trained to perform the recordings and explain the basic parameters of the recordings.Student will learn to perform blood pressure measurement and heart auscultation. Also student will learn to determine the respiratory volumes and capacities.

Course description

Theoretical education

INTRODUCTION IN PHYSIOLOGY: Functional organisation of human body and control of homeostasis. Cells as basic living units of human body and their function. Homeostatic mechanisms of main functional systems. RESPIRATION: Gases characteristics. Ventilation. Lung volumes and capacities. Physiological characteristics of pulmonary circulations. Transport of gases to the cells. Main and accessory respiratory musculature. Interpleural pressure. Regulation of respiration. Kinds and types of respiration. Respiration in the conditions of decreased and increased atmospheric pressure. BLOOD: Basic characteristics of blood. Blood plasma. Red blood cells. White blood cells. Imunity and imune bodies. Platelets. Coagulation and hemostasys. Blood types. Transfusion and transplantation. CIRCULATION AND LYMPH: functional characteristics of circulation. Morphofunctional characteristics of the heart muscle. Heart hemodinamics. Conductive system of the heart. Registration and analysis of ECG. Mechanical work and eficiency of the heart. Regulation of the heart. Circulation. Capilary exchange. Peripheral circulation. Puls: definition, types and characteristics. Blood flow in veins. Lymph. Neurohumoral mechanisms of blood vesels tone regulation. DIGESTION AND ABSORPTION: Definition of digestion. Basic functions of the digestive system. Digestion in the mouth. Saliva, regulation of salivation. Vomiting. Digestion in the stomach. Digestion in the small intestine. Roles of the pancreas in digestion. Bile. Digestion in the large intestine. Defecation. METABOLISM: Role of nutrients. Minerals and vitamins. Methods of investigation of the metabolism. Respiratory quotient. Basal metabolism. Metabolism in physical activity. Design of the daily menu. THERMOREGULATION: Mechanisms of maintainance of the temperature balance of the body core. Physical and chemical thermoregulation. Physiological basis of hypo- and hyperthermia. EXCRETION: Physiology of the kidneys. Ultrastucture of the nephrons. Filtration, secretion and reabsorption in the kidneys. Quantity and quality of the urine. Role of the kidneys in homeostasis. Regulation of the kidneys. Miction. EXCITABLE TISSUE: Resting potential. Action potential. Laws of excitation. Acomodation. Laws of excitation polarity. Electrotonus. Polatisation currents. SENSES: Senses. Receptors. Vision. Lences and ophtalmoscopy. Hearing. Equilibrium. Muscle-joint perceprion. Tactile and termal perception. Visceroreception. Smell and taste. Pain. MUSCLES: Neuro – muscular synapses. Mediators and basic mechanisms of synaptic transmission. Types of muscles. Morpho-physiological characteristics of striated muscle. Types of striated muscle acitons. Motor unit. Tone and termogenesis of muscle Work, power and muscle fatique. Smooth muscle. AUTONOMOUS NERVOUS SYSTEM: Sympathetic and parasymphetetic nervous system: structure, classification, of the vegetative ganglia and their function, specific mediators. Division of vegetativen reflexes and the significance of dual organ inervation. ENDOCRINOLOGY: Basic characterstics of hormones and methods of investigation of endocrine glands. Thyreoid gland. Parathyreoid gland. Pancreas. Suprerenal gland. Male and female gonades. Pituitary gland: hormones, function, and regulation of secretion. Hypothalamo-pituitary complex. Other organs with endocrine role: thymus, epyphiseal gland, spleen, and kidney. Tissue hormones. PHYSIOLOGY OF CENTRAL NERVOUS SYSTEM: Neuron. Types of synapsis in CNS. Neuromediators. Neuroglia. Nervous center. Inhibition in CNS. Spinal cord. Medula oblongata and pons. Reflex function. Functional significance of conductive pathways in medulla oblongate. Mid brain. Reticular formation of brainstem. Cerebellum. Hypothalamus. Lymbic structures of the brain. Cortex. Basal ganglia. Theory of sleep. Types of nervous system. Memory and learning. Conciousness.

Practical education: exercises, other forms of education, research related activities

1. Excitable tissue (reobasis, chronaction, useful time, anelectrotone, catelectrotone, polarization current, Pflüger lows). 2. Muscles (basic and complex muscle contraction, summation, influence of intensity of stimuli on the size of muscle contraction, maximal muscle contraction with different loads, ergography, influence of temperature and fatigue on muscle contraction). 3. Breathing (model of the ribs, Donders model, spirometry, spirography, pneumography, forced spirometry, air content). 4. Digestion (digestion in the mouth, digestion in the stomach). 5. Heart and the circulation (heart regulation, ECG, measurement of the blood pressure,

auscultation, polycardiography, capillaries). 6. Blood (plasma buffers, sedimentation, hematocrit, hemolysis , red blood and white blood cell count, white blood cell formula, time of coagulation and bleeding). 7. Excretion (general characteristics of the urine, chemical chr. of urine, urine sediment). 8. Senses (examination of the eyes, ears and hearing, balance, surface and deep sensibility). 9. CNS (spinal reflexes of the decapitated frog, spinal shock, testing of the reflex arc, examination of the reflexes of clinical significance, EEG, neuronal activity, EMNG, EP, reaction).

Literature

Compulsory

1. Guyton AC. Textbook of medical Physiology. Esevier, 2016.

Additional

1. Despopulos A, Silbernagl S. Color Atlas of Physiology. Thieme, 2009.
2. Bruce KM. Berne & Levy Physiology. Mosby Elsevier, 2010.
3. Costanzo LS. Physiology. Elsevier, 2014.

Number of active classes				Other:
Lectures: 150	Practice: 120	Other types of teaching:	Research related activities:	

Teaching methods: lectures; laboratory work.

Student activity assessment (maximally 100 points)

Pre-exam activities	**points**	**Final exam**	**points**
Lectures	15	Written	70
Practices	15	Oral	
Colloquium		.....	
Essay			