Aim of the course

The subject Medical Biochemistry 2 has an irreplaceable role in study of medicine. The students should learn about biochemical reactions beyond all living processes including diseases. The knowledge will help them later to diagnose and treat many diseases correctly. To distinguish pathological from normal it is necessary to master and understand the meaning of massive amounts of chemical reactions taking place in the cell, which is called cellular metabolism. Acquisition of these facts is the main aim of the subject medical biochemistry.

Education: lectures/practical
Assessment: SS - exam (see Requirements)

Syllabus

Metabolism of nitrogen compounds


Nucleic acids

Proteosynthesis
Proteosynthesis in prokaryotic and eukaryotic cells: activation of amino acids, initiation, elongation and termination of proteosynthesis. Regulation and inhibition of proteosynthesis. Inhibitors of proteosynthesis. Co- and post-translational modification of proteins and peptides. Protein folding. Secretion and membrane proteins - synthesis and

**Organ and tissues biochemistry**

Regulation of metabolic processes - the basic regulatory mechanisms of intermediary metabolism on the cell level (e.g., cells compartmentalization, limiting metabolites Michaelis kinetics, allosteric control of key enzymes, changing the concentration of enzyme, induction and repression). Mutual relations metabolism of carbohydrates, lipids, proteins and nucleic acids - essential metabolites and enzymes of the intermediate metabolism. Principles of hormonal regulation. The chemical structure of hormones and distribution. The mechanisms of hormones action. Role of NO in regulation. CNS role in metabolism regulation.

Biochemistry of blood - specificity of metabolism of the RBC. Function of hemoglobin (transport O$_2$ and CO$_2$). Biosynthesis and degradation of heme and molecular disorders (e.g., porphyria, hyperbilirubinemia). Plasma proteins and their physiological and biochemical functions, the salting-out and electrophoretical characterization of plasma proteins. Blood clotting process, diseases associated with blood function. Acid-base balance, acidosis and alkalosis, blood buffer systems (bicarbonate, phosphate, hemoglobin, proteins). The metabolism of water and the function of the water in living systems. Minerals in the body – their role, metabolism, disease and diagnostic importance of them.

Biochemistry and role of liver. Biochemical processes in the liver. Metabolic disorders of the liver. Markers of liver damage. Xenobiotics and their biotransformations, the role of liver cells in detoxification of xenobiotics, types of basic biotransformation reactions. The role of kidney in metabolism. Biochemical processes occurring in the kidney. Renal regulation of ion and water exchange. The role of the kidney in maintaining acid-base balance. Meaning liver and kidney in compound detoxification. The biochemical nature of viral infections and neoplastic processes. The biochemical nature of apoptosis and prion diseases (e.g., Creutzfeldt-Jacob disease, 'mad cow disease').


Clinical biochemistry. Biological material. Basic analytical reactions and determination of biologically active substances (e.g., use of enzymes in the diagnosis, inflammatory markers).