SYLLABUS

Subject:	**MEDICAL BIOCHEMISTRY**		
Field of study:	*General Medicine*	**Degree of study:**	*III.*
Study programme:	*Clinical Biochemistry*	**Form of study:**	*Internal / External*
Subject evaluation:	*Exam*	**Subject type:**	*Compulsory course*

Department: **Department of Medical and Clinical Biochemistry UPJŠ FM**

Lectures and seminars ***WT*** *https://portal.lf.upjs.sk/index-en.php*

CELL BIOCHEMISTRY
- General features of cellular metabolism
- Cell and subcellular localization of biochemical processes
- Redox processes and their energetics
- Biological membranes and cell transport

ENZYMES
- Ezymes in metabolism - structure, specificity, classification, activity, units, mechanism of action
- Kinetics of enzyme reactions, Michaelis and Menten equation, inhibition of enzyme activity
- Factors influencing the rate of enzymatic reactions
- Principles of regulation of enzyme activity, allosteric enzymes
- Diagnostically important enzymes

CITRATE CYCLE **1th Revision test**
- Oxidative decarboxylation of pyruvate
- Citrate cycle - reactions, enzymes, regulation and energy balance
- Acetyl CoA - biochemical significance
- Anaplerotic reactions

RESPIRATORY CHAIN
- Respiratory chain - electron transport and oxidative phosphorylation
- Factors affecting respiration
- Inhibitors, disconnectors
- Other redox systems

METABOLISM OF SACCHARIDES I
- Carbohydrate digestion
- Glucose transporters
- Glycolysis - reactions, enzymes, regulation, energy balance, importance
- Gluconeogenesis - reactions, enzymes, regulation, significance
- Pentose phosphate cycle
- Glycogen metabolism - enzymes, regulation, disorders
- Metabolism of galactose, mannose and fructose

METABOLISM OF SACCHARIDES II **2nd Revision test**
- Metabolism of uronic acids
- Metabolism of aminosaccharides
- Metabolism of glycosaminoglycans and glycoproteins
- Glucose-6-phosphate - importance in carbohydrate metabolism
- Disorders of carbohydrate metabolism

LIPID METABOLISM I
- Lipid digestion
- β-oxidation of fatty acids (FA) - saturated, unsaturated, with an odd number of C atoms, α, ω-oxidation of FA
- Ketone bodies - metabolism, importance
- Biosynthesis of FA - reactions, enzymes, regulation
- Metabolism of triacylglycerols
- Cholesterol - transport, metabolism, regulation, importance, bile acids - metabolism, function
- Synthesis and degradation of steroid hormones

LIPID METABOLISM II **3th Revision test**

- Lipoproteins - composition, classification, meaning
- Metabolism of lipoproteins
- Metabolism of phospholipids
- Sphingolipids and glycolipids
- Eicosanoids - characterization, classification, metabolism, biomedical significance
- Disorders of lipid metabolism

Lectures and seminars ***ST*** *https://portal.lf.upjs.sk/index-en.php*

AMINO ACID METABOLISM I

- The role of proteins and amino acids in metabolism
- Cleavage of proteins and peptides in the digestive tract
- General amino acid metabolism
- Transport and detoxification of ammonia, urea cycle
- Metabolism of the carbon skeleton of amino acids

AMINO ACID METABOLISM II

- Biosynthesis of individual amino acids
- Biosynthesis of catecholamines and tetrapyrroles
- Formation of biogenic amines
- Transport and interorganization of amino acids
- Pathobiochemistry of amino acids metabolism

NUCLEOTIDE METABOLISM

- Synthesis of *de novo* ribonucleotides and deoxyribonucleotides
- Nucleotide degradation - Salvage reactions (recycling reactions)
- Regulation of nucleotide formation

INTERMEDIATE RELATIONS METABOLISM AND THEIR REGULATION

- General principles of regulation
- Significance of acetyl CoA in metabolism
- Interrelationships of substrate metabolism **1th Revision test**

BIOCHEMISTRY OF BLOOD

- Erythrocyte metabolism
- Tetrapyrrole dyes for human blood and tissues
- Disorders of porphyrin metabolism
- The role of plasma proteins
- Blood clotting, congenital blood clotting disorders
- ABR - basic mechanisms of regulation

LIVER AND METABOLISM OF FOREIGN SUBSTANCES – XENOBIOCHEMISTRY

- Biochemical functions of the liver
- Disorders of liver metabolism
- Xenobiochemistry - distribution, resorption of xenobiotics
- Metabolism of xenobiotics, biotransformation reactions

BIOCHEMISTRY OF KIDNEY

- The role of the kidney in homeostasis
- Kidney metabolism
- Ultrafiltration, reabsorption, secretion
- Use of creatinine, urea and other markers to assess renal function
- Importance of determination of selected metabolites in urine

CHEMICAL COMMUNICATIONS IN LIVING SYSTEMS **2nd Revision test**

- Signal transmission to the cell
- Hormones and neurotransmitters
- Biochemical structure of hormones
- Receptors - structure, classification, properties, mechanisms of signal transmission
- Apoptosis

BIOCHEMISTRY OF NERVOUS AND MUSCLE TISSUE

- Biochemistry of nervous tissue, action/resting potential
- Synapse, synaptic transmission
- Neurotransmitters, receptors
- Organization of muscle fibers, muscle proteins
- Contraction and relaxation of skeletal, cardiac and smooth muscle, regulation of muscle activity

HARD TISSUE METABOLISM

- Composition of bones and teeth
- Synthesis and degradation of collagen
- Mineralization and demineralization
- Connective tissue proteins
- Bone remodeling cycle, remodeling regulation
- Function and regulation of calcium and phosphorus

BIOCHEMISTRY OF THE EYE AND VISION

- The structure of the eye, the chemical composition of individual eye structures
- Rhodopsin, opsin and retinal, isomerization of retinal
- Signal cascade, biochemical processes in light and dark
- Glucose metabolism in the vision process

OXIDIZING STRESS **3th Revision test**

- Characteristics of free radicals - reactive forms of oxygen and nitrogen
- Formation and transformation of free radicals in the body
- Oxidative damage of lipids, proteins and NAs
- Antioxidants

BIOCHEMICAL BASIS OF NUTRITION

- Nutrition and biological value of food
- Nutrient requirements, proper nutrition
- Influence of food technology and processing on digestion, resorption and utilization of nutrients
- Food additives
- Nutritional problems - e.g., obesity