UNIVERSITY OF NOVI SAD
FACULTY OF MEDICINE

Study program: Integrated academic studies in Pharmacy

Course title: Medical Biochemistry

Teacher: Ljiljana N. Andrijević, Karmen M. Stankov, Jasmina N. Katanić, Jelena D. Stojčević Maletić, Bojan G. Stanimirov, Vanesa Z. Sekeruš

Course status: compulsory

ECTS Credits: 6

Condition: General Biochemistry

Course aim:

The goal of the course in Medical Biochemistry is to understand complex metabolic processes in the human body, their regulation by the action of hormones, signaling molecules and other biochemical molecules, for a better understanding of both physiological and pathological processes. In addition, to provide an overview of basic biochemical methods used in laboratory diagnostics in clinical biochemical laboratories with special reference to the influence of drugs on the results of biochemical analyzes.

Expected outcome of the course:

Knowledge of specific biochemical processes of various tissues and organ systems and their importance for the functioning of the organism as a whole. Biochemical basis of functional tests of individual organ. Proper sampling and the use of biological material for biochemical analysis. The use individual of analytical procedures and instruments in a biochemical laboratory. Proper interpretation of the results of biochemical analyzes, normal and reference values. Analysis of the metabolism of the most important constituents of the organism on the basis of measurements in biological samples.

Contents of the course:

Theoretical education

1. Biochemistry of hormones. Organization of the endocrine system. Adeno and neurohypophysis hormones. Hormones derived fromAK. Thyroid hormones and adrenal marrow. Adrenal cortex hormones. Full of hormones. 2. Digestion and absorption of carbohydrates. General carbohydrate metabolism pathways. Liver and muscle in glucose metabolism. 3. Regulation of blood glucose levels. Hormones in glycide metabolism, insulin, IGF1, IGF2. Glucagon, corticosteroids, somatostatin. Adrenaline, T-3, T-4, somatotropin. 4. Diabetes mellitus, classification, glucose intolerance, metabolic consequences of insulin deficiency. Acute andchronic complications of diabetes mellitus. 5. Digestion of proteins and amino acid absorption. General routes of protein metabolism, nitrogen equilibrium, hormones in protein metabolism. 6. Total blood plasma proteins, hypo- and hyperproteinemia. Single bloodplasma proteins. Immunoglobulins - structure and disorders. Proteinuria, types of proteinuria. Primary and secondary disorders of protein metabolism. 7. Lipid digestion and absorption. Fatty acids, transport, catabolism and ketogenesis. Metabolism of triacylglycerol and phospholipids. 8. Cholesterol metabolism. Apolipoproteins, classification and composition of lipoproteins. Lipid transport, exogenous and endogenous pathway. 9. Role of liver and adipose tissue in lipid metabolism. Lipoprotein metabolism disorders. 10. The role of water in the human body, distribution and volume in individual body spaces. Isovolemia, isotonia, isoonia and isohydria. Water movement and distribution, control of renal water excretion, eight- and volume receptors, ADH, renal response and aldosterone. Mechanism of action of ADH, aquaporins. 11. Water intake control, disorders. Dehydration, water and sodium deficiency and biochemical aspects of dehydration. Hyperhydration, excess water and sodium, biochemical aspects of hyperhydration. 12. Sodium metabolism, regulation, disorders. 13. Potassium metabolism, regulation, disorders. 14. Chloride metabolism, regulation, disorders. 15.Acido-base equilibrium. Physiological buffers. Renal and respiratory regulation. Acid-base balance disorders 16. Factors affecting the change in plasma enzyme levels. Selection of enzyme assays. Isoenzymes. Enzymopathies. Diagnostically important enzymes. 17. Mineral metabolism. Calcium metabolism. Regulation of calcium metabolism. Hypo- and hypercalcemia disorders. Phosphate and magnesium metabolism. Hypo- and hyperphosphatemia and magnesium disorders. Metabolism of iron. Disorders iniron metabolism, sideropenic anemia. Iron status testing. 18. Organ and tissue biochemistry. Structure and function of hemoglobin. Hemoglobinopathies. Porphyry. Blood biochemistry, erythrocyte biochemistry, blood coagulation. 19. Liver function test. 20. Kidney function test. 21. Urine tests. Physical and chemical examination of urine. 22. Examination of gastrointestinal tract function. 23. Effect of drugs on the results of biochemical analyzes.

Practical education

1. Measurements in Medical Biochemistry. Calculation of reference range values. Precision and accuracy of measurements. 2. Photometry - Principles of Lambert-Beer Law. Extinction and molar extinction coefficient. Blank and standard solution. Application of photometry. Determination of concentration by photometric measurement. 2. Quantitative determinationof blood glucose - review of methodology. Plasma glucose quantification. 3. Determination of ketone bodies in urine. 4. Quantitative determination

of protein concentration in blood plasma - review of methodology. Determination of blood plasma protein concentration. Determination of albumin concentration. 5. Determination of serum protein fractions and A / G indexes - review of methodology. 6. Lipoprotein metabolism. Determination of cholesterol and triacylglycerol serum concentration. 7. Quantitative determination of enzyme activity - review of methodology. Determination of alkaline phosphatase activity. 8. Determination of enzyme activity using UV test. Determination of LDH, ALT, AST and CK activity in blood serum. 9. Mineral metabolism. Metabolism of calcium. Quantitative determination of calcium in plasma. 10. Metabolism of phosphates and magnesium. Quantitative determination of phosphate and magnesium in blood plasma. 11. Metabolism of iron and hemoglobin. Quantitative determination of serum iron, UIBC, TIBC. Determination of hemoglobin concentration. 12. Qualitative analyzes of bile pigments. Qualitative analysis of direct and indirect serum bilirubin. Demonstration of bilirubin, urobilinogen and urobilin in urine. Quantitative determination of serum bilirubin. 13. Quantitative determination of creatinine. 14.Clearance tests. 15. Physico-chemical testing of urine and analysis of urine sediment.

Literature

Compulsory

1. Rifai N, Horwath R A, Wittwer C. Tietz Textbook of Clinical chemistry and molecular diagnostics, Elsevier, St. Louis, Missouri, 2018.
2. 2. Kovačević Z, Milošević Tošić M. Practical Biochemistry and Molecular Biology, Novi Sad, 2001.

Number of active classes	**Theoretical classes:** 45	**Practical classes:** 45

Teaching methods

Lectures for small groups with the use of multimedia didactic materials. Practical work: work in medical laboratories.

Student activity assessment (maximally 100 points)

Pre-exam activities	**points**	**Final exam**	**points**
Lectures	8	Written	
Practices	12	Practical	15
Colloquium	25	Oral	40
Essay			