### Subject:
Medical Biochemistry 2

### Study Programme:
Dental Medicine

### Study Period:
3. semester

### Evaluation:
exam

### Subject Type:
compulsory

### Content:
2 h. lectures and 3 h. practical exercises / week

#### Total 70 hours

### Department:
Department of Medical and Clinical Biochemistry,
UPJŠ in Košice, Faculty of Medicine

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<table>
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<tr>
<th>Week</th>
<th>Lectures</th>
<th>Practical Lessons</th>
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<tr>
<td>1.</td>
<td><a href="http://portal.lf.upjs.sk">http://portal.lf.upjs.sk</a></td>
<td>Metabolism of proteins</td>
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<td></td>
<td>METABOLISM OF AMINO ACIDS I.</td>
<td>1. The safety rules in laboratory</td>
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<td></td>
<td>- Catabolism – degradation of amino acids (AA)</td>
<td>2. Determination of total proteins of blood serum (patient)</td>
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<td></td>
<td>- Urea cycle – reaction, enzymes, regulation</td>
<td><strong>Seminar:</strong></td>
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<td></td>
<td>- Metabolism of carbon skeleton of AA</td>
<td>1. Repetition of lipids metabolism (p. 70)</td>
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<td></td>
<td>- Intermediates of glycolysis and Krebs cycle and their roles in AA metabolism</td>
<td>2. Protein digestion (p. 90)</td>
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<td>2.</td>
<td>METABOLISM OF AMINO ACIDS II.</td>
<td>Metabolism of amino acids I.</td>
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<td></td>
<td>- Anabolism – biosynthesis of AA</td>
<td>1. Isolation of albumin and globulin of blood serum</td>
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<td></td>
<td>- Biogenic amines – formation, degradation, importance</td>
<td>2. Determination of ammonia in urine (patient)</td>
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<td></td>
<td>- Metabolism of serotonin, thyroxine and creatine</td>
<td><strong>Seminar:</strong></td>
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<td></td>
<td>- Biosynthesis of tetrapyrroles</td>
<td>1. Protein metabolism (p. 93)</td>
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<td>- Pathobiochemistry of amino acid metabolism</td>
<td>2. Amino acid metabolism (p. 94)</td>
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<td>METABOLISM OF NUCLEOTIDES</td>
<td>Metabolism of amino acids II.</td>
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<td>- <em>De novo</em> synthesis of purine and pyrimidine nucleotides</td>
<td>1. Determination of urea in blood serum (patient)</td>
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<td>- Synthesis of deoxyribonucleotides</td>
<td>2. Proof of phenyl pyruvate presence in blood serum</td>
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<td>- Degradation of nucleotides</td>
<td><strong>Seminar:</strong></td>
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<td>- Inhibitors of purine and pyrimidine biosynthesis – relation to the chemotherapy of cancer</td>
<td>1. Detoxification of ammonia (p. 110)</td>
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<td>- Metabolism of nucleotides</td>
<td>2. Degradation of carbon skeleton of amino acids (p. 96)</td>
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<td>4.</td>
<td>1. REVISION TEST</td>
<td>Metabolism of nucleotides</td>
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<td>INTERMEDIARY METABOLISM RELATIONSHIPS</td>
<td>1. Determination of uric acid in blood serum (patient)</td>
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<td>- Mutual relations in metabolism of saccharides, lipids and proteins</td>
<td>2. The solubility of uric acid and its salts</td>
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<td>- Metabolic pathways</td>
<td><strong>Seminar:</strong></td>
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<td>- Molecular basis of mutations</td>
<td>1. Metabolism of nucleotides (p. 113)</td>
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<td>GENETIC MATERIAL AND REPLICATION OF DNA</td>
<td>2. Disorders in metabolism of nitrogen compounds (p. 119)</td>
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<td>- Organization of genetic material (genes)</td>
<td>Diagnostic usage of the enzymes of cell metabolism</td>
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<td>- Replication of DNA in <em>E. coli</em> and in higher animals</td>
<td>1. Determination of AST activity (patient)</td>
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<td>- Molecular basis of mutations</td>
<td>2. Determination of ALP activity (patient)</td>
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<td>TRANSCRIPTION OF DNA AND PROTEOSYNTHESIS</td>
<td><strong>Seminar:</strong></td>
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<td></td>
<td>- Biosynthesis of tRNA, mRNA, rRNA</td>
<td>1. Enzymes in blood (p. 14)</td>
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<td>- Molecular mechanism of proteosynthesis,</td>
<td>2. Distribution of diagnostically important enzymes in tissues (p. 17)</td>
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<td>- Regulation and inhibition of proteosynthesis</td>
<td>Biochemistry of nucleic acids</td>
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<td>6.</td>
<td>REGULATION OF GENE EXPRESSION</td>
<td>1. Isolation of nucleoprotein</td>
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<td>- The principles of gene expression regulation</td>
<td>2. Hydrolysis of nucleoproteins</td>
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<td>- Gene manipulations and gene therapy</td>
<td>3. Proof composition of nucleotides</td>
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<td>- Reverse transcriptase and AIDS virus</td>
<td><strong>Seminar:</strong></td>
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<td></td>
<td>- Folding process of proteins, co- and posttranslation modifications</td>
<td>1. Biochemistry of nucleic acids (p. 124)</td>
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<td>- Diagnostic usage of DNA analysis – molecular methods</td>
<td>2. Methods of cleaving of DNA (p. 136)</td>
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<tr>
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<td>- Diagnostic usage of DNA analysis – molecular methods</td>
<td>3. Amplification of DNA by PCR reaction (p. 140)</td>
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# CLINICAL BIOCHEMISTRY

### 2. REVISION TEST

#### CHEMICAL COMMUNICATIONS IN LIVING SYSTEMS
- Chemical compounds as signal molecules
- Chemical structure and classification of hormones
- Mechanism of hormone action
- Receptors – structure, classification, properties, mechanisms of signal transduction

#### LIVER AND METABOLISM OF FOREIGN COMPOUNDS - XENOBIOCHEMISTRY
- Biochemical functions of the liver
- Disturbances of the liver metabolism
- Xenobiotics – classification, resorption and binding
- Metabolism of xenobiotics – biotransformation reactions, conjugation

#### SPECIALISED METABOLIC PATHWAY OF SELECTED TISSUES
- Biochemistry of kidney
- Biochemistry of muscle tissue
- Contraction – relaxation cycle of muscles
- Connective tissue (collagen, elastin)
- Biochemistry of nervous tissue – neurotransmitters

#### ORAL BIOCHEMISTRY
- Inorganic components of hard tissues
- Metabolism of calcium and phosphates in dental tissue
- Metabolism of other elements of dental tissue
- Organic components of teeth
- Mineralization – crystals formation
- Theories of mineralization

#### ORAL PATHOBIOCHEMISTRY
- Saliva – composition, importance
- Dental plaque and tartar
- Biochemistry of tooth decay
- Pathobiochemistry of inflammatory periodontal diseases
- Condition of the body and its effect on the oral cavity

#### 3. REVISION TEST

#### BIOCHEMISTRY AND PATHOBIOCHEMISTRY OF DIGESTION AND NUTRITION
- Nutrition and biological value of nutrients
- Requirements for nutrients content – limiting AAs
- Impact of technology and modification of nutrients on digestion, resorption and usability of nutrients

#### CLINICAL BIOCHEMISTRY
- Biological material
- Factors affecting the results and interpretation of biochemical examination
- Diagnostic and therapeutic application in medicine

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**Biochemistry of blood**
- Determination of bilirubin in blood serum (patient)
- Hemoglobin and its derivatives

**Seminar:**
- Blood (p. 148)
- Metabolism of tetrathyroles (p. 115)

**Acid-base balance**
- Models of acid-base balance
- Determination of $HCO_3^-$

**Seminar:**
- Acid-Base balance (p. 150)

**Metabolism of liver**
- Determination of ALT in blood serum (patient)
- Determination of $\gamma$-glutamyl transferase activity (patient)

**Seminar:**
- Liver (p. 171)
- Responses of the liver to toxic damage (p. 174)

**Metabolism of selected tissues**
- Biochemical examination of urine (patient)
- Determination of creatinine in blood serum (patient)

**Seminar:**
- Kidney (p. 176)
- Disorders of kidney (p. 178)

**Biochemistry of minerals**
- Determination of calcium
- Determination of inorganic phosphorus
- Determination of HCl output by the gastric mucosa

**Seminar:**
- Metabolism of mineral substances (p. 158)
- Muscle (p. 180)
- Importance of HCl in the stomach (p. 163)

**Oral biochemistry**
- Argentometric determination of chlorides in saliva
- Proof of thiocyanates presence in saliva

**Seminar:**
- Digestive system, oral cavity (p. 163)
- Biochemistry and metabolism of bones (p. 188)

**Colloquium**
- Individual performance of selected practical tasks
- Individual assessment of students' work

**Evaluation of student’s work**
- Patient evaluation - determination of diagnosis based on results of biochemical examinations
- Credit donation