

## Criteria necessary for accreditation of the subject “Clinical chemistry and laboratory diagnostics”

### 1) Mandatory classes:

- Seminars clinical chemistry, 5<sup>th</sup> semester, Mon. – Thurs. 11am/12pm-1/2pm
- Intensive course 10<sup>th</sup>-14<sup>th</sup> semester week, additionally two evening classes per student per semester

### 2) Concordant class

- Lecture clinical chemistry, 5<sup>th</sup> semester, Mon.+ Wed. 10:30am – 12 pm, 10<sup>th</sup>-14<sup>th</sup> semester

### 3) Record of achievement:

Written exam at the end of the 5<sup>th</sup> semester

### 4) Learning objective:

Learning catalog for clinical chemistry and lab diagnostics

- General clinical chemistry
  - a) Clinical chemical findings (general, blood sample, influencing variable, interfering factors, reference intervals, sensitivity, specificity, predictor variable, assessment of results)
  - b) Clinical-chemical analysis (gaining the sample from the specimen, separation and analysis procedure, standards and control samples, unit of measurement, error sources and quality assurance, analysis assessment)
- Molecular diagnostics
  - a) Verification procedure (PCR, Hybridization, RFLP)
  - b) Polymorphism, mutation, phenotype-genotype-relationship, predisposition and disease probability
- Enzymes
  - a) Congenital and acquired dysfunction (enzyme activity in the plasma, tissue and organ distribution, specific enzyme activity patterns in the plasma, reduction or increase in enzyme activity as a reaction to regulatory, toxic or therapeutic influences (i.e. Vit.K- antagonists, enzyme induction pharmaceuticals))
  - b) Lab tests (enzyme in plasma/serum (diagnostic significance of changes due to organ-dysfunctions, analysis of enzyme and iso-enzyme activity))
- Proteins
  - a) Pathobiochemistry of the carbohydrate metabolism (digestion and malabsorption, enzyme defects in the cellular metabolism, Diabetes mellitus, hunger state and fasting)

- b) Lab tests (blood-/plasma-/serum- and urine-glucose, glycosylated proteins, function tests of the carbohydrate metabolism, additional exams)
- Lipids and lipoproteins
  - a) Pathobiochemistry of the lipid and lipoprotein metabolism (lipoproteins, primary hyper- and dyslipoproteinemia, secondary hyperlipoproteinemia)
  - b) Lab tests (total cholesterol, tryglicerides, ldl-, hdl- cholesterol (direct measurement), lipoprotein electrophoresis, ultracentrifugation, atherogenic lipoprotein results)
- Salt-, water- and acid-base- balance
  - a) Pathobiochemistry of the salt-, water- and acid-base- balance (malfunctions in the water- and salt- balance (Sodium, potassium, Magnesium, Calcium, phosphate), acid-base imbalance)
  - b) lab tests (flame photometry, potentiometry, atom absorption, osmolality, judgment of problems in the acid-base-balance)
- Internal secretion
  - a) Pathobiochemistry of internal secretion (mechanisms of endocrinopathies, hypothalamus-anterior pituitary hormone system, thyroid hormones, Ca-metabolism, adrenal cortex hormones, androgens, ovarian hormones, placenta hormones, pancreatic island cell hormones)
  - b) Lab tests (pituitary hormones, thyroid hormones, parathormone/Calcitonin/Vit. D, adrenal hormones, catecholamines, serotonin, function tests)
- Blood and blood producing organs
  - a) Pathobiochemistry of blood and blood producing organs (Hematopoiesis, anemia, polycythemia, polyglobulia, leukocytosis, leukemia)
  - b) Lab tests (test material, automated hemogram (cell counter), reticulocytes, hemoglobin anomalies, morphologic evaluation of blood smears and bone marrow, flow cytometry)
- Hemostasis
  - a) Pathobiochemistry of hemostasis (primary and secondary hemostasis, thrombocyte- dysfunction, impairments in plasmatic clotting, increased fibrinolysis, thrombophilia, hemorrhagic diatheses (hemophilia, Von Willebrand Disease), disseminating intravascular coagulation)
  - b) Lab test (platelet function tests, chromogenic and coagulation assays of secondary hemostasis, markers of congenital and acquired thrombophilia, Phenprocoumon and heparin monitoring (INR), D-Dimer)
- Malignant growth
  - a) Pathobiochemistry of malignant growth (cancer genesis, molecular biology of malignant growth, tumor cell metabolism, bilirubin metabolism, porphyries, cirrhosis, cholestasis, acute and chronic liver

insufficiency, Porto systemic encephalopathy, mal-circulation of the liver, ascites, hepatitis)

- b) Lab tests (enzyme levels in plasma/serum, bile pigments, assessment of the liver function, NH<sub>3</sub>, hepatitis diagnostic etc.)
- Heart
  - a) Pathobiochemistry of acute coronary syndrome and heart failure (myocardial ischemia, definition of infarct, treatment options, heart failure
  - b) Lab tests (pathological EKG findings, cardiac markers and their time window: CK, CK-MB, cardiac troponin, myoglobin, natriuretic peptides)
- Kidney
  - a) Pathobiochemistry of the kidney (disorders in the glomerular filtration, problems in the tubular reabsorption and secretion, urine concrements, acute renal failure, chronic renal failure, glomerulonephritis)
  - b) Lab tests (urine status, creatinine in plasma/serum and urine, creatinine clearance, cystatin C, osmolality of urine, proteinuria)
- Neural- and sensory system
  - a) Pathobiochemistry of liquor (Blood-brain-, blood -liquor-barrier, protein, ion, metabolite, cell-number and -type concentration-alterations in infectious, degenerative and circulatory diseases in the area of the meninges and CNS)
  - b) Lab tests (liquor extraction and inspection, examination of cell number and distribution in liquor, glucose and lactate in liquor, oligoclonal bands, "Reiber scheme")
- Therapeutic Drug monitoring and clinical-toxicology analysis
  - a) General fundamentals (blood sampling, pharmacodynamics, pharmacokinetic (Zero- and first- order kinetics)
  - b) Lab tests (chromatography, homogeneous immunoassays, drug screening)