



CD 8.5.1 DISCIPLINE CURRICULUM

Edition: 06

Date: 20.09.2017

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FACULTY OF MEDICINE STUDY PROGRAM 0912.1 MEDICINE CHAIR OF LABORATORY MEDICINE

APPROVED

at the meeting of the Commission for Quality Assurance and Evaluation of the Curriculum, Faculty of Medicine
Minutes No. ___ of _____

Chairman _____
Name, surname _____

APPROVED

at the Council meeting of the Faculty of Medicine
Minutes No. ___ of _____

Dean of Faculty, MD, PhD, Associate Professor
Bețiu Mircea _____

APPROVED

approved at the meeting of the laboratory medicine chair
Minutes No. 3 of 24.11.2017
Head of chair, MD, PhD, Associate Professor
Vișnevschi Anatolie _____

SYLLABUS

DISCIPLINE LABORATORY MEDICINE

Integrated studies

Type of course: **optional**

Chisinau, 2017



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I. INTRODUCTION

- **General discipline presentation: place and role of the discipline in the formation of the specific competences of the professional / specialty training program**

The value and necessity of the Laboratory Medicine course for medical students is due to the role of laboratory testing in the care of patients that is uniformly recognized as a critical component of modern medical care. More than 70% of all paraclinical information, required to the clinician, comes from medical laboratory.

The knowledge of future medical specialists should include information about complexity and necessity of laboratory investigations. Students should know that laboratory tests can be used for multiple clinical purposes: screening, risk assessment, establishment of a diagnosis, support of a diagnosis, exclusion of a diagnosis, prognosis, determination of individualized therapy, and assessment of disease progression or response to therapy. They should understand the differences in interpretation that these settings require and that laboratory tests must be interpreted in conjunction with the entire clinical presentation. They should be able to order not only all of the tests, necessary in a particular clinical setting, but also the tests that are medically useful for their patients. They should know their limitations of knowledge in this area and how to seek appropriate consultation from clinical pathologists, clinical scientists, midlevel provider laboratory personnel, and other subspecialists, in order to maximize appropriate patient care. They should understand the scientific underpinnings of laboratory medicine, for the purpose of proper use of current testing and also to be able to wisely assess future modalities. They should also understand the therapeutic modalities available from the clinical laboratory, and understand the cost-effective, evidence-based use of the treatments.

Future clinicians must be familiar with organization of medical laboratory, have to know the operating rules, biosafety and the quality control of management system in medical laboratory.

- **Mission of the curriculum (aim) in professional training** is designed to reinforce key concepts that apply to laboratory tests ordered for patients in the health care system. These concepts help to maintain a high quality of health care through:
 - Choosing the best tests in order to arrive at a correct diagnosis and treatment plan in a timely manner.
 - Interpreting test results properly in the context of testing methodologies and inherent variabilities.
 - Avoiding orders for tests that negatively impact care through misleading results or higher costs or subjecting patients to unnecessary or unfavorable procedures or treatments.
- **Language of the course:** English.
- **Beneficiaries:** students of the 5th year, faculty Medicine 2.

II. MANAGEMENT OF THE DISCIPLINE

Code of discipline	S.09.A.092/3		
Name of the discipline	Laboratory medicine		
Person(s) in charge of the discipline	Anatolie Vişnevschi , head of chair, MD, PhD, Associate Professor		
Year	5	Semester/Semesters	9
Total number of hours, including:			30
Lectures	20	Practical/laboratory hours	
Seminars		Self-training	10
Clinical internship			
Form of assessment	C	Number of credits	1



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III. TRAINING AIMS WITHIN THE DISCIPLINE

At the end of the discipline study the student will be able to:

✓ ***at the level of knowledge and understanding:***

- To know the instructions regarding the existing, possible or presumed risks for medical laboratories; Every student must be familiar with all aspects of health and bio-safety in the medical laboratory from the beginning;
- To know the rules for the collection and preservation of biological materials in order to obtain the real results of the laboratory investigations;
- To know the normal values of the main laboratory parameters and their physiological variations according to the age, gender, diet, physical effort etc.;
- To know the contemporary methods in diagnostic of laboratory indicators.;
- To know the clinical value of changes the laboratory parameter in certain pathologies.

✓ ***at the application level:***

- To apply the theoretical knowledge in practice of professional activity;
- To apply the factors that affect the result of analyzes in the harvest, transport and storage and in the actual analysis and post-analysis phase;
- To apply the diagnostic values of the main laboratory parameters in different nosological entities;
- To request the general tests for the erythrocyte, leucocyte, kidney function, inflammatory response, endocrine and hepatic function.
- To apply specific laboratory investigation algorithms for certain pathologies;
- To justify necessity to perform certain laboratory tests in specific conditions;
- To interpret the results of the laboratory tests correctly, according to the clinical dates and the results of the functional examination.

✓ ***at the integration level:***

- To integrate the theoretical and practical knowledge on the basic notions of the module of laboratory medicine for the diagnostic and monitoring diseases in the context of clinical scenario;
- To integrate the clinical-diagnostic values of the laboratory parameters in certain nosological entities;
- To integrate the results of the laboratory investigations with the clinical and functional examination dates in order to establish or materialize the clinical diagnosis;
- To integrate importance of knowledge and skills from the applicative fields that are connection to laboratory medicine;
- To integrate importance of knowledge and skills accumulated to adapt medical treatment, dietary and hygienic regimen according to the dynamics of laboratory parameters.

IV. PROVISIONAL TERMS AND CONDITIONS

The study of laboratory medicine at university level will allow future physicians to justify the need for laboratory investigation, interpret the results of the laboratory tests and correlate results with clinical and functional data in order to establish the diagnosis, hygienic and dietetic correction and the indication of a therapy adapted to the mechanisms of producing pathology.

To acquire the discipline it is necessary:

- Knowledge of the instruction language;
- Knowledge in the field of Biochemistry, Histology, Morphopathology, Physiology, Pathophysiology, Hematology, Internal Medicine, Immunology, etc.;
- Digital competences (use of the Internet, document processing, electronic tables and presentations, use of graphics programs);
- Ability to communicate and team work;



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- Qualities - tolerance, compassion, autonomy.

V. THEMES AND ESTIMATE ALLOCATION OF HOURS

Lectures, practical hours/ laboratory hours/seminars and self-training

No. d/o	THEME	Number of hours	
		Lectures	Self-training
1.	The role of laboratory medicine in the medical system. Biosafety and biosecurity of the medical analysis laboratory. Instructions regarding existing or presumed risks for medical laboratories.	2	1
2.	Organization and management of the medical analysis laboratory.	2	1
3.	The pre-analytical phase in the clinical laboratory. Pre-analytical factors with impact on laboratory analyses.	2	1
4.	The analytical and post-analytical phase in the clinical laboratory. Analytical and post-analytical factors with impact on laboratory analyses.	2	1
5.	Exploration of the erythrocyte series. CBC. Study of peripheral blood smear. Study of the medullar smear. Special investigations in different types of anemia.	2	1
6.	Exploration of the leucocyte series. White blood cell count. The peripheral blood smear. Classification of leukocyte series diseases.	2	1
7.	Evaluation of renal function. The urine. The urinalysis. Clinical-diagnostic significance of urine exploration.	2	1
8.	Investigation of the inflammatory reaction.	2	1
9.	Evaluation of endocrine system functions	2	1
10.	Evaluation of liver function.	2	1
Total		20	10

VI. REFERENCE OBJECTIVES OF CONTENT UNITS

Objectives	Content units
Theme (chapter) 1. Laboratory medicine. Organization of a medical analysis laboratory	
<ul style="list-style-type: none"> • To define the notion of medical analysis laboratory, pre-analytical, analytical and post-analytical stage of laboratory testing. • To know the functional structure of the laboratory, the organization of the laboratory space, utilities, furniture and equipment. • To know about the supply of reagents, materials, equipment and services (eg. maintenance, service, calibration, waste disposal, etc.). • To get familiar with all aspects of health and biosafety in the medical analysis lab. • To identify the pre-analytical, post-analytical and analytical variables of the laboratory test process. • To apply the pre-analytical, post-analytical and 	Organization of clinic laboratory. Medical laboratories activity rules. Biosafety and Biosecurity of the Medical Analysis Laboratory. Pre-analytical factors with impact on laboratory analyzes. Analytical and postanalytical factors with impact on laboratory analyzes. Pre-analytical, analytical, post-analytical errors. Critical result of the laboratory test. Reference interval. Fundamental principles in interpreting the results of laboratory analyzes.



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Objectives	Content units
<p>analytical variables in making the medical decision.</p> <ul style="list-style-type: none"> • To apply knowledge to other disciplines • To formulate conclusions. • To demonstrate abilities to analyze and systematize knowledge. 	
<p>Theme (chapter) 2. Clinical and diagnostic significance of the erythrocyte, leukocyte and renal function exploration.</p>	
<ul style="list-style-type: none"> • To define the clinical-diagnostic significance of the erythrocyte and leucocyte series, and of urine exploration. • To know basic information regarding to the morphology and counting of blood cells, microscopy of urine and results of automatic examination, coloring and examination of peripheral blood smears. • To know the determination and interpretation of ESR, hematocrit, erythrocyte indices, deviation of the leukocyte formula. • To know the determinations of a complete urinalysis. • To interpret the results of a complete blood count test, complete urinalysis. • To apply knowledge in case studies analysis. • To integrate the acquired knowledge in the medical field. • To apply knowledge in other disciplines. • To formulate conclusions. • To demonstrate abilities to analyze and systematize knowledge. 	<p>Complete blood count (CBC). The importance of CBC in determining the hematological status and the diagnosis of various diseases.</p> <p>Preparing the patient for analysis. Specimen collection, recipient and collected quantity. Causes of sample rejection.</p> <p>Hematocrit, erythrocytes level, hemoglobin content, erythrocyte indices, reticulocytes, leukocyte differentiation role, reference values and changes both in health and disease.</p> <p>The main processes of glomerular ultrafiltration description. Organic and inorganic constituents of urine. Physical characters of urine (color, appearance, specific gravity); Urine chemical characters (pH, protein, glucose, ketone, erythrocytes, bilirubin, urobilinogen, leukocytes); Microscopic examination of the urinary sediment;</p>
<p>Theme (chapter) 3. Laboratory exploration of the inflammatory reaction, endocrine and hepatic functions.</p>	
<ul style="list-style-type: none"> • To define and to know the main aspects of the inflammatory reaction, endocrine and hepatic functions. • To know the inflammatory response, endocrine and hepatic functions exploration methods. • To understand the principles and techniques of inflammatory response, endocrine and hepatic system functions exploration methods. • To request general tests of inflammation, endocrine and hepatic functions. • To demonstrate inflammatory response, endocrine and hepatic functions analytical skills. • To apply the acquired knowledge in diagnosis and treatment optimization. • To integrate the knowledge regarding the exploration 	<p>Definition and classification: Inflammatory reaction. General Inflammatory Tests: Leukogram - total leucocyte count and leukocyte formula; Erythrocyte sedimentation rate; Acute phase proteins; Electrophoresis of plasma proteins. Interpretation of general tests of inflammation.</p> <p>General aspects of endocrine function disturbances. General classification of endocrine disorders. Laboratory exploitation of the main thyroid disorders: hyper- and hypothyroidism. Laboratory exploitation of the main suprarenal diseases: excess and deficiency of adrenal hormones.</p> <p>Tests that define the four syndromes of hepatic disease - hepatocytolysis, excreto-biliary,</p>



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Objectives

- of the inflammatory reaction, endocrine and hepatic functions in the optimization of the therapeutic act.
- To apply knowledge in other disciplines.
 - To formulate conclusions.
 - To demonstrate analytical and practical skills related to laboratory exploration of the inflammatory response, endocrine and hepatic functions.

Content units

hepatodepressive and immunologic-inflammatory syndrome.
Defining hepatocytolysis syndrome, cholestatic syndrome in the context of liver disease tests interpretation.
Identifying types of jaundice with tests that define excreto-biliary syndrome and interpreting their changes in the etiopathogenic context.

VII. PROFESSIONAL (SPECIFIC (SC)) AND TRANSVERSAL (TC) COMPETENCES AND STUDY OUTCOMES

✓ Professional (specific) (SC) competences

- PC1. Knowledge, understanding and using of laboratory-specific language.
- PC2. Knowledge, understanding and operating with theoretical knowledge and specific methods of investigation of laboratory medicine.
- PC3. Knowledge and understanding of the interdependence between the physiological or pathological state of the body and changes in cellular composition and biological fluids in order to select the right laboratory test and to ensure the appropriate use of laboratory investigations.
- PC4. Application of knowledge related to laboratory methods in the early detection of disease, and in epidemiology, in disease-related diagnosis, in organ-related diagnosis, in monitoring vital functions, in monitoring response to therapy, in the field of drug monitoring, in indications for subsequent specialist examinations and indications for function tests.
- PC5. Determination and interpretation of clinical *significance* of laboratory analysis results.
- PC6. Knowledge of principles and norms of medical analysis laboratories organization and functioning.
- PC7. Recognition of pre-analytical factors that influence the validity of the analytical process and the ability to spread their importance for laboratory medicine.
- PC8. Knowledge and practical application of the knowledge related to the exploitation of the erythrocyte, leucocyte, urine, inflammatory reaction, endocrine and hepatic functions in relation with the patient, in order to ensure the optimal therapeutic management.
- PC9. Practical use of the knowledge and fundamental elements regarding the laboratory methods in the interests of population health protection.

✓ Transversal competences (TC)

- TC1. Responsible and efficient implementation of the tasks and activities related to the profession respecting the principles and norms of professional ethics;
- TC2. Identification of specific teamwork roles in various medical institutions taking appropriate professional and personal responsibilities;
- TC3. Promotion of logical reasoning, practical applicability, assessment and self-assessment in decision-making;



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- TC4. Promotion of the initiative spirit, dialogue, cooperation, positive attitude and respect for others, empathy, altruism and continuous improvement of their own activity;
- TC5. Development of critical-constructive reflection on professional level of education in relation to professional standards.

✓ Study outcomes

After completing the course of Laboratory Medicine, the student shall develop the ability to:

- evaluate the role of laboratory medicine in the training of the medical student as well as in the medical system.
- know the principles and rules of medical analysis laboratories organization and operation.
- identify, define and describe the main pre-analytical, analytical and post-analytical variables with impact on laboratory analyzes.
- know the role of laboratory tests in screening, diagnosis, health status monitoring, prognosis of disease evolution/health status.
- motivate the usefulness of performing certain laboratory tests.
- identify and interpret the clinical-diagnostic significance of the exploration of the erythrocyte series, leukocyte series, urine, inflammatory reaction, endocrine and hepatic functions in relation to the patient.
- make optimal decisions in situations where critical laboratory results are obtained;
- implement the gained knowledge in the research activity;
- communicate their knowledge to others, including those who lack specialist knowledge in the field.

VIII. STUDENT'S SELF-TRAINING

No.	Expected product	Implementation strategies	Assessment criteria	Implementation terms
1.	Working with information sources	Working systematically in the library. To read the lecture or the material in the manual, reflecting on the subject. To get acquainted with the list of additional information sources. To select the source of additional information regard with studied subjectin . Exploring current online sources studied in the topic.	1. Quality of judgments, logical thinking, flexibility, interpretative skills. 2. The quality of the systematization informational material obtained through its own activity.	During the course
2.	Analysis of case study	Case study description. Distinguish changes in laboratory analysis in the case study. To analyse causes of changes in laboratory analysis in the case study. Deduction of the case – interpreting the results(establisling the clinical diagnosis). Prognosis of case.	1. Analysis, synthesis, generalization of rezults obtained through own investigation. 2. To form a algorithm knwoledge based on the obtained conclusions.	During the course

IX. METHODOLOGICAL SUGGESTIONS FOR TEACHING-LEARNING-



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ASSESSMENT

• *Teaching and learning methods*

For the teaching process of the Laboratory Medicine subjects are used a wide variety of methods oriented towards the efficient acquisition and achievement of the objectives of the didactic process. The following teaching and learning methods are used in theoretical and practical lessons: exposition, interactive lecture, heuristic conversation, problem-solving, brainstorming, individual study, work with manual and scientific text. In order to acquire deeper material are used different semiotic systems (scientific language, graphical and computerized language) and didactic materials (schemes, laboratory analysis, tables with reference intervals). Communication Technologies - PowerPoint presentations are used for the lessons.

• *Methods of assessment (including the method of final mark calculation)*

• **Current:** *frontal and / or individual control through*

• (a) applying docimological tests

• (b) analysis of case studies

• **Final:** simple colloquium (credit)

• **The final mark** will consist of the average score from one control work.

Method of mark rounding at different assessment stages

Intermediate marks scale (annual average, marks from the examination stages)	National Assessment System	ECTS Equivalent
1,00-3,00	2	F
3,01-4,99	4	FX
5,00	5	E
5,01-5,50	5,5	
5,51-6,0	6	
6,01-6,50	6,5	D
6,51-7,00	7	
7,01-7,50	7,5	C
7,51-8,00	8	
8,01-8,50	8,5	B
8,51-8,00	9	
9,01-9,50	9,5	A
9,51-10,0	10	

The average annual mark and the marks of final assessment are expressed in numbers according to the mark scale (according to the table), and the final mark obtained is expressed in number with two decimals, which is transferred to student's record-book.

Missed assessments without sufficient cause are recorded as "absent" and is equivalent to 0 (zero). The student has the right to have two re-examinations.

X. RECOMMENDED LITERATURE:

A. Compulsory:

1. Richard A. Mc Pherson, Matthew R. Pincus - Henry's Clinical Diagnosis and Management by Laboratory Methods - 22e Hardcover, August 16, 2011.
2. Materials of the theoretical course.

B. Additional

1. Susan King Strasinger - Urinalysis and Body Fluids - Kindle Edition.