



DISCIPLINE SYLLABUS

«Veterinary Clinical Biochemistry»

Degree of higher education - Master
Specialty - 211 Veterinary Medicine
Educational program «Veterinary Medicine»
Year of study - 4, semester - 7
Form of full-time study, full-time study
Number of ECTS credits – 4
The language of instruction is English | Ukrainian

Course lecturer

Tsvilikhovskiy V.I., Associate Professor of the Department of Biochemistry and Physiology of Animals named after Acad. M.F. Hulyi, Candidate of Biological Sciences, Associate Professor

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Course page in eLearn

<https://elearn.nubip.edu.ua/course/view.php?id=1345>

DESCRIPTION OF THE DISCIPLINE

The discipline "Veterinary Clinical Biochemistry" is a mandatory component of the educational program "Veterinary Medicine". It gives students an understanding of the relationship between abnormal laboratory data and specific organ dysfunctions; diagnosis and prognostic value of laboratory tests; mastery of the technique of correct sampling and interpretation of results for hematological and clinical chemical evaluation.

The study of the discipline "Veterinary Clinical Biochemistry" provides the acquisition of such general competencies as knowledge and understanding of the subject area, the ability to search, process and analyze information from various sources, the ability to apply knowledge in practical situations.

The study of the discipline "Veterinary Clinical Biochemistry" provides the acquisition of such professional competencies as the ability to use modern knowledge about the laws of clinical biochemistry in the clinical diagnosis of various species of animals; have modern tools, devices and other equipment for the diagnosis of diseases and treatment of animals; ability to carry out clinical and laboratory studies of animals and samples of biological material for the purpose of lifelong and postmortem diagnosis of diseases; ability to use knowledge and practical skills for the prevention of non-communicable and infectious diseases and the treatment of animals; ability to organize work in accordance with the requirements of life safety and labor protection in the field of veterinary medicine; be able to make predictions about the state of animal health.

ACQUISITION COMPETENCIES

Integrated competency (IC):

Ability to solve complex tasks and problems in the industry of veterinary medicine, which involves carrying out research and/or implementation of innovations and is characterized uncertainty of conditions and requirements.

General competencies (GC):

1. Ability to abstract thinking, analysis and synthesis.
2. Ability to apply knowledge in practical situations.
3. Knowledge and understanding of the subject area and profession.
4. Ability to communicate in the state language both orally and in writing.
5. Ability to conduct research at the appropriate level.
6. Ability to make informed decisions.
7. The desire to preserve the environment.

Professional (special) competencies (PC):

1. Ability to use tools, special devices, instruments, laboratory equipment and other technical means to carry out the necessary manipulations during professional activities.
2. Ability to follow the rules of labor protection, asepsis and antiseptics during professional activities.
3. Ability to take, pack, record and send samples of biological material for laboratory research.
4. Ability to organize and conduct laboratory and special diagnostic tests and analyze their results.
5. Ability to apply knowledge of biosafety, bioethics and animal welfare in professional activities.
6. Ability to develop and implement measures to protect the population from diseases common to animals and humans.
7. Ability to protect the environment from contamination by livestock waste, as well as materials and veterinary products.
8. Ability to use specialized software to perform professional tasks.
9. Ability to organize, implement and control the flow of documents during professional activities.

Program learning outcomes (PLO):

Attestation is carried out in the form of a single state qualifying exam.

COURSE STRUCTURE

Theme	Hours (lectures / laboratory)	Learning outcomes	Tasks	Assessment
One semester				
Thematic Module 1.				
Theme 1. Objects and methods in veterinary clinical biochemistry.	1/4	<p><i>Know:</i> methods of obtaining and preparing for the study of blood, urine, saliva, scar content, digestive juices, bile, cerebrospinal fluid, synovial fluid and other biological fluids of domestic and farm animals, physico-chemical methods of clinical biochemistry and instrumentation;</p> <p>species, breed and age features of biochemical parameters (blood, urine, cerebrospinal fluid, digestive juices, saliva, etc.) in healthy animals and their dependence on physiological condition, type of feeding and productivity; international system of SI units in clinical laboratory diagnostics.</p> <p><i>Be able</i> to receive plasma and blood serum, to determine the pH of body fluids.</p> <p><i>Use</i> centrifuges, homogenizers, pH meters, photoelectrocolorimeters and other modern laboratory devices</p>	Preparation for lectures (preliminary acquaintance with the presentation and full-text lecture in eLearn). Execution and delivery of laboratory work (in methodical recommendations - during laboratory employment, and independently - in eLearn). Doing independent work (tasks in eLearn). Preparation and writing of a modular test (descriptive part in the form of written / oral answer - in the classroom, test - in eLearn).	4

		for laboratory studies of the animal body.		
Theme 2. Disorders of protein metabolism in the case of diseases of the internal organs of animals.	2/8	<p><i>Know:</i> violation of protein homeostasis; etiology of hypo- and hyperproteinemia, dysproteinemia, paraproteinemia and proteinuria; clinical interpretation of the results of determining the content of total protein and protein fractions; the importance of colloidal sediment tests in the diagnosis of disorders of protein metabolism in pathology of the liver and other organs; biochemical methods for diagnosing pathology of protein metabolism in the body; methods and clinical and diagnostic value of determination in blood and urine of components of residual Nitrogen (urea, variable Nitrogen, uric acid, ammonia, creatine, creatinine, indican, etc.); azotemia (relative and absolute, productive and retention).</p> <p><i>Be able</i> to determine total protein and its blood fractions and non-protein nitrogenous compounds in blood and urine.</p> <p><i>Use</i> centrifuges, photoelectrocolorimeters, spectrophotometers and other modern laboratory devices for</p>	Preparation for lectures (preliminary acquaintance with the presentation and full-text lecture in eLearn). Execution and delivery of laboratory work (in methodical recommendations - during laboratory employment, and independently - in eLearn). Doing independent work (tasks in eLearn). Preparation and writing of a modular test (descriptive part in the form of written / oral answer - in the classroom, test - in eLearn).	8

		laboratory research.		
Module 2. General and special clinical biochemistry				
Theme 3. Laboratory diagnosis of disorders of carbohydrate metabolism in the case of diseases of the internal organs of animals.	2/6	Know: disorders of intermediate carbohydrate metabolism (synthesis and breakdown of monosaccharides, oligosaccharides, glycogen); disorders of gluconeogenesis; clinical interpretation of hypo- and hyperglycemia, glucosuria, fructosuria and galactosuria; disorders of heteropolysaccharide metabolism; disorders of intermediate lipid metabolism in the case of diseases of the intestines, liver and pancreas; adiposity. lipomobilization syndrome; fatty infiltration of the liver, atherosclerosis; ketogenesis and its disorders; indicators of lipid peroxidation and antioxidant defense system of the body; biochemical methods for diagnosing disorders of carbohydrate and lipid metabolism.	Preparation for lectures (preliminary acquaintance with the presentation and full-text lecture in eLearn). Execution and delivery of laboratory work (in methodical recommendations - during laboratory employment, and independently - in eLearn). Doing independent work (tasks in eLearn). Preparation and writing of a modular test (descriptive part in the form of written / oral answer - in the classroom, test - in eLearn).	13
Theme 4. Laboratory diagnosis of disorders lipid metabolism in the case of diseases of the internal organs of animals.	2/6	Be able to determine glucose and its derivatives, cholesterol, ketone bodies in the blood and urine. Use centrifuges, photoelectrocolorimeters, spectrophotometers and other		

		modern laboratory devices for laboratory research.		
Theme 5. Clinical enzymological. Primary and secondary enzymopathy.	2/4	<p><i>Know:</i> mechanisms of hyperenzymemia; types of enzymopathies; enzyme diagnostics and enzyme therapy; indicator enzymes and their role in the diagnosis of diseases of various organs and systems; determination of enzyme spectrum activity of enzymes (aspartate aminotransferase, alanine aminotransferase, lactate dehydrogenase, gamma-glutamyltranspeptidase, alkaline and acid phosphatases, glutamate dehydrogenase, creatine phosphokinase, alpha-amylase; clinical interpretation of the obtained results.</p> <p><i>Be able</i> to determine aspartate aminotransferase, alanine aminotransferase, gamma-glutamyltranspeptidase in the blood.</p> <p><i>Use</i> centrifuges, photoelectrocolorimeters, spectrophotometers and other modern laboratory devices for laboratory research.</p>	Preparation for lectures (preliminary acquaintance with the presentation and full-text lecture in eLearn). Execution and delivery of laboratory work (in methodical recommendations - during laboratory employment, and independently - in eLearn). Doing independent work (tasks in eLearn). Preparation and writing of a modular test (descriptive part in the form of written / oral answer - in the classroom, test - in eLearn).	11
Theme 6. Enzymodiagnosics in the pathology of the internal organs of animals.	0/4			
Theme 7. Clinical chemistry with the pathology of the digestive system, liver and	2/4	<i>Know:</i> laboratory diagnosis of metabolic disorders during pancreatic dystonia in ruminants,	Preparation for lectures (preliminary acquaintance with the presentation and full-text	10

pancreas.		<p>acidosis and scar alkalosis; laboratory diagnosis of disorders of metabolic processes in diseases of the stomach and intestines of different species of animals; disorders of carbohydrate, lipid and protein metabolism in liver pathology; biochemistry and pathobiochemistry of bilirubin metabolism in the liver; biochemical methods for diagnosing liver dysfunction and monitoring its recovery.</p> <p><i>Be able</i> to determine total and direct bilirubin, vitamin A in serum (plasma).</p> <p><i>Use</i> centrifuges, photoelectrocolorimeters, spectrophotometers and other modern laboratory devices for laboratory research.</p>	<p>lecture in eLearn). Execution and delivery of laboratory work (in methodical recommendations - during laboratory employment, and independently - in eLearn). Doing independent work (tasks in eLearn). Preparation and writing of a modular test (descriptive part in the form of written / oral answer - in the classroom, test - in eLearn).</p>	
Theme 8. Biochemistry and pathobiochemistry blood system in animals in the pathology of internal organs.	2/2	<p><i>Know:</i> hemoglobin metabolism disorders; biochemical changes in the blood during anemia; mechanisms of blood coagulation and pathobiochemistry of blood coagulation; disorders of the hemostasis system (hypocoagulation, hypercoagulation and discoagulation); disorders of myocardial metabolism in</p>	<p>Preparation for lectures (preliminary acquaintance with the presentation and full-text lecture in eLearn). Execution and delivery of laboratory work (in methodical recommendations - during laboratory employment, and independently - in eLearn). Doing independent work (tasks in eLearn). Preparation and writing of a modular test</p>	8

		<p>myocardial infarction, myocarditis, pericarditis, coronary heart disease and heart attack; biochemical methods for diagnosing myocardial diseases.</p> <p><i>Be able</i> to determine the hemoglobin of blood and urine.</p> <p><i>Use</i> centrifuges, photoelectrocolorimeters, spectrophotometers and other modern laboratory instruments and equipment for laboratory research.</p>	(descriptive part in the form of written / oral answer - in the classroom, test - in eLearn).	
Theme 9. Determination of water-electrolyte and acid-base status of animals in the pathology of the internal organs of animals.	0/2	<p><i>Know:</i> disorders of water-electrolyte metabolism in the case of diseases of the internal organs of animals; types of dehydration; causes of hypo- and hypernatremia, hypo- and hyperkalemia, hypo- and hyperchloremia; characteristics of acid-base balance in animals and mechanisms of their regulation; acid-base imbalance in animal diseases; biochemical methods for diagnosing disorders of water-ion metabolism and acid-base balance in the body.</p> <p><i>Be able</i> to determine total phosphorus, calcium, buffer capacity in the blood and acid-base status of blood and urine.</p> <p><i>Use</i> centrifuges,</p>	Preparation for lectures (preliminary acquaintance with the presentation and full-text lecture in eLearn). Execution and delivery of laboratory work (in methodical recommendations - during laboratory employment, and independently - in eLearn). Doing independent work (tasks in eLearn). Preparation and writing of a modular test (descriptive part in the form of written / oral answer - in the classroom, test - in eLearn).	6

		photoelectrocolorimeters, spectrophotometers and other modern laboratory instruments and equipment for laboratory research.		
Theme 10. Laboratory diagnosis in the pathology of the urinary system	2/4	<p><i>Know:</i> features of metabolism in the kidneys and in pathology; glomerular filtration rates and their diagnostic value; biochemical methods of diagnosis in case of kidney pathology; changes in the chemical composition of urine in diseases of the urinary system (glomerulonephritis, pyelonephritis, nephrotic syndrome, nephrosclerosis, renal failure, urolithiasis and urocystitis); pathological components of urine and their diagnostic value; biochemical mechanisms of urolithiasis.</p> <p><i>Be able to</i> determine urea and creatinine in the blood and urine.</p> <p><i>Use</i> centrifuges, photoelectrocolorimeters, spectrophotometers and other modern laboratory instruments and equipment for laboratory research</p>	Preparation for lectures (preliminary acquaintance with the presentation and full-text lecture in eLearn). Execution and delivery of laboratory work (in methodical recommendations - during laboratory employment, and independently - in eLearn). Doing independent work (tasks in eLearn). Preparation and writing of a modular test (descriptive part in the form of written / oral answer - in the classroom, test - in eLearn).	7
Theme 11. Biochemical methods immunodeficiency state of animals.	0/1	<p><i>Know:</i> changes in thymol and zinc sulfate tests for parenchymal hepatitis and liver cirrhosis;</p>	Preparation for lectures (preliminary acquaintance with the presentation and full-text	3

	<p>changes in serum γ-globulin concentrations in bacterial, viral, autoimmune and parasitic infections, cholecystitis, liver cirrhosis, pyelonephritis, acute polyarthritis, sepsis, hemolytic jaundice; the importance of hypogammaglobulinemia in the depletion of the immune system and the causes of agammaglobulinemia.</p> <p><i>Be able</i> to determine thymol, zinc sulfate tests, blood immunoglobulins.</p> <p><i>Use</i> centrifuges, photoelectrocolorimeters, spectrophotometers, immunochromatography and other modern laboratory instruments and equipment for laboratory research</p>	<p>lecture in eLearn). Execution and delivery of laboratory work (in methodical recommendations - during laboratory employment, and independently - in eLearn). Doing independent work (tasks in eLearn). Preparation and writing of a modular test (descriptive part in the form of written / oral answer - in the classroom, test - in eLearn).</p>	
Total for the semester			70 points
Test			30 points
All together			100 points

EVALUATION POLICY

Deadline and recompilation policy:	Laboratory, independent and modular works must be submitted in the planned time before the end of the study of the current module. Violation of the deadlines without a good reason entitles the teacher to lower the grade. Reassignment of modular control work occurs in the presence of valid reasons (for example, hospital) and is allowed in the term before the end of the following module.
Academic Integrity Policy:	Copying, use of mobile devices, and additional literature when writing modular tests, tests and exams are strictly prohibited.
Visiting policy:	Attendance at lectures and laboratory classes is mandatory for all students in the group. Late classes are not allowed. A lab coat is a must in laboratory classes. For objective reasons (for example, illness, international internship) training can take

place according to an individual curriculum approved in a certain order. Missed lectures, after their processing by the applicant of higher education, are worked out in the form of an interview with the teacher. Missed laboratory classes are worked out by students in the laboratory of the department, information about the practice is entered into the departmental journal of the practice of missed classes.

STUDENT EVALUATION SCALE

Rating of the applicant of higher education, points	The national assessment is for the results of examinations, tests	
	exam	tests
90-100	excellent	credited
74-89	good	
60-73	satisfactorily	
0-59	unsatisfactorily	not credited

RECOMMENDED SOURCES OF INFORMATION

Educational and methodological support.

1. Tomchuk V., Tsvilikhovskiy V., Grishchenko. Guidelines for training on discipline. K., NUBiP Ukraine, 2022. 67 p.
2. Томчук В.А., Грищенко В.А., Цвіліховський В.І. Методичні вказівки для самостійної роботи з дисципліни “Ветеринарна клінічна біохімія”. К., ВЦ НУБіП України, 2015. 101 с.

Recommended sources of information

Basic

1. Ветеринарна клінічна біохімія: навч. посіб. / Мельничук Д. О. та ін.; 2-ге вид. перероб і доп. Київ: НУБіП України, 2014. 456 с.
2. Ангельські С., Якубовські З., Домінічак М. Клінічна біохімія /; пер. з пол. Сопот, 1998. 451 с.
3. Ветеринарна клінічна біохімія / Левченко В. І., та ін. ; 2-ге видання, перероб. та доп. Біла Церква: Аграрна наука, 2019. 416 с.
4. Горячковский А. М. Клиническая биохимия. Одесса: Астропринт, 1998. 608 с.

Supplemental

1. Tomchuk V.A., Gryshchenko V.A., Tsvilikhovskiy V.I. Veterinary clinical biochemistry: textbook / Part 1. K.: НУБіП України, 2016. 268 p.
2. Tomchuk V.A., Gryshchenko V.A., Tsvilikhovskiy V.I. Veterinary clinical biochemistry: textbook / Part 2. K.: НУБіП України, 2017. 365 p.
3. Клінічна біохімія : навч. посіб. для студ. вищ. навч. зал. / О. П. Тимошенко, та ін.; 2-ге видання. Київ: ВД «Професіонал», 2005. 288 с.
4. Кононський О. І. Біохімія тварин: підруч. для студ. вищ. навч. зал. / 2-ге вид. К.: Вища шк., 2006. 454 с.
5. Куртяк Б. М., Янович В. Г. Жиророзчинні вітаміни у ветеринарній медицині. Львів: Тріада плюс, 2004. 426 с.

6. Фізіологія тварин / Мазуркевич А. Й. та ін. Вінниця: Нова книга, 2010. 418 с.
7. Мейер Д., Харви Д. Ветеринарная лабораторная медицина. Интерпретация и диагностика / пер. с англ. М.: Софион, 2007. 456 с.