BIOCHEMISTRY AND MOLECULAR BIOLOGY

Study program	Veterinary Medicine
Year of study	II
Semester	I
Regime of discipline	DOB
Category of discipline	Dsf
Number of lecture hours per week	2
Number of seminar/laboratory/project hours per week	2
Total number of hours according to the curriculum: lectures/seminars/laboratory/project	28/28
Number of transferable credits	4

SPECIFIC SKILLS

Professional Competence	**•C1 - Knowledge, understanding and acquisition of the nomenclature of clinical biochemistry, metabolism and molecular biology. Acquire general knowledge and specific characteristics of biochemistry (energy metabolism, metabolism of carbohydrates, lipids, antidotes and metabolism of nucleic acids, hydromineral metabolism, techniques used in biochemistry and molecular biology) by classical methods and using modern methods . Ability to perform biochemical correlations to allow the interpretation of possible metabolic disorders based on knowledge of the physiological and pathological biochemical mechanisms for their production.** **•C2 - To acquire the theoretical and practical knowledge of the biochemistry of metabolites under physiological and pathological conditions, acquiring the ability to perform qualitative and quantitative biochemical tests on various biological materials (blood, urine, other biological fluids, organs and other tissues). Acquire the adequate and efficient skills to collect samples, store, transport, correctly select laboratory tests, interpret results and write and communicate the results obtained.** **•C3 - Knowledge of the biochemical characteristics of domestic animals allowing the evaluation and characterization of the nutritional and metabolic state according to the principles of maintenance, feeding, production, breeding and selection of animals, while respecting the principles of biosecurity imposed by the legislation in use.** **•C4 - Identification of functional changes in certain tissues and their correlation with possible deficiencies in metabolites.** **•C5 - Correlation of certain metabolic and / or nutritional deficiencies leading to diseases with symptoms of disease and search for means to correct them.** **•C6 - Learning outcomes and skills in the use of techniques used in biochemistry and molecular biology.** **•C7 - Application of the requirements imposed by the principles of quality assurance and risk management in the field of clinical biochemistry; active participation in the audit in order to increase the performance of the biochemical analysis and molecular biology laboratory.** **•Inter and / or transdisciplinary integration of knowledge in the field.**

LEARNING OUTCOMES

Knowledge	**The student describes the structure and functions of biomolecules, the fundamental biochemical mechanisms, the regulation of metabolism and the molecular basis of intermetabolic relationships.**
Skills	**Applies biochemical and molecular analysis methods; uses the**

	equipment correctly and follows laboratory procedures; interprets experimental results and correlates them with physiological and pathological processes.
Responsibility and autonomy	**Demonstrates responsibility in handling biological samples, complies with quality and safety standards, collaborates effectively in interdisciplinary teams and shows interest in continuous professional development.**

COURSE OBJECTIVES

General objective of the course	• Knowledge of aspects of the enzymes, nucleic acids carbohydrates, proteins and hydromineral metabolism, as well as knowledge of molecular biology aspects relating to intermediary metabolism and the applicability of specific techniques in biochemistry and molecular biology. • Correlation of metabolic deficiencies with characteristic pathology in domestic animals. • Adjustment and deregulation of metabolic functions correlated with certain species of domestic animals.
Specific objectives	• Identify the physiological and pathological metabolic pathways of energy, carbohydrate, lipid, antidodic, hydroelectrolytic and nucleic acid metabolism, as well as the process of regulation and deregulation of these metabolic processes. • Acquire the chemical structures specific to the metabolic pathways presented in the course and understand their utility for intrametabolic and intermetabolic transformations and correlations. • Correctly use nomenclature and terminology specific to biochemistry and molecular biology. • Analyze the metabolic pathways specific to the various biochemical constituents. • Identify based on laboratory analyzes the presence or absence of metabolites (from different biological materials) and interpret the results obtained. • • Qualitatively and quantitatively analyze laboratory metabolites from various biological materials (blood - serum, urine).

COURSE CONTENT

LECTURES	Number of hours
Nucleic acid metabolism. The structure of nucleic acids.	**2**
Catabolism and anabolism of purine, pyrimidine bases.	**2**
Regulation of nucleic acid metabolism.	**2**
Protein metabolism. General amino acid catabolism. Deamination.	**2**
Transamination, decarboxylation. The synthesis of urea. The synthesis of glutamine.	**2**
Specific catabolism and anabolism of amino acids.	**2**
Carbohydrate metabolism. Carbohydrate catabolism. Anaerobic degradation of glucose. Aerobic degradation of glucose. The path of the pentosophosphates. The uronic acid pathway.	**2**
Carbohydrate anabolism: glycogenesis, gluconeogenesis, glycogenogenesis.	**2**
Biosynthesis of other complex carbohydrates. Regulation and deregulation of carbohydrate metabolism.	**2**
Lipid metabolism. Fatty acid metabolism.	**2**
Metabolism of glycerides, glycerophospholipids and sphingolipids. Metabolism of sphingolipids. Steroid metabolism. Biosynthesis of ketone bodies.	**2**
Regulation and dysregulation of lipid metabolism.	**2**
Metabolic interrelations. Metabolic diseases.	**2**
Techniques used in Molecular Biology. Fundamental research in biochemistry and molecular biology.	**2**
SEMINAR/LABORATORY	Number of hours
Nucleic acid metabolism. The structure of nucleic acids.	2
Catabolism and anabolism of purine, pyrimidine bases.	2

Regulation of nucleic acid metabolism.	2
Protein metabolism. General amino acid catabolism. Deamination.	2
Transamination, decarboxylation. The synthesis of urea. The synthesis of glutamine.	2
Specific catabolism and anabolism of amino acids.	2
Carbohydrate metabolism. Carbohydrate catabolism. Anaerobic degradation of glucose. Aerobic degradation of glucose. The path of the pentosophosphates. The uronic acid pathway.	2
Carbohydrate anabolism: glycogenesis, gluconeogenesis, glycogenogenesis.	
Biosynthesis of other complex carbohydrates. Regulation and deregulation of carbohydrate metabolism.	2
Lipid metabolism. Fatty acid metabolism.	2
Metabolism of glycerides, glycerophospholipids and sphingolipids. Metabolism of sphingolipids. Steroid metabolism. Biosynthesis of ketone bodies.	2
Regulation and dysregulation of lipid metabolism.	2
Metabolic interrelations. Metabolic diseases.	2
Techniques used in Molecular Biology. Fundamental research in biochemistry and molecular biology.	2

BIBLIOGRAPHY:

- Nelson D.L., Cox M.M. (2021) Lehninger Principles of Biochemistry, 8th Edition, W.H. Freeman and Company, New York.
- Rodwell V.W., Bender D.A., Botham K.M., Kennelly P.J., Weil P.A. (2021) Harper's Illustrated Biochemistry, 32nd Edition, McGraw-Hill Education, New York.
- Kaneko J.J., Harvey J.W., Bruss M.L. (2008) Clinical Biochemistry of Domestic Animals, 6th Edition, Academic Press, San Diego.
- Thrall M.A., Weiser G., Allison R.W., Campbell T.W. (2012) Veterinary Clinical Pathology, 2nd Edition, Wiley-Blackwell, Ames, Iowa.
- Alberts B., Johnson A., Lewis J., Morgan D., Raff M., Roberts K., Walter P. (2022) Molecular Biology of the Cell, 7th Edition, Garland Science, New York.

ASSESSMENT

Activity type	Assessment criteria	Assessment methods	Percentage of final grade
Lectures	Communication in the discipline of biochemistry and molecular biology involves the use of correct language. Demonstration of coherent and logical thinking in the expression of ideas or principles. Apply the knowledge acquired from lessons and laboratory work, and perform tests to identify and measure physiological and pathological metabolites.	Summative assessment - writing assessment - multiple choice test and oral exam.	60%
Seminar/laboratory/clinical sessions	Apply the knowledge acquired from lessons and laboratory, perform tests to identify and measure physiological and pathological metabolites. Preparation of a documentary report on the given subject, subject to strict editing requirements, and presentation of the documentary bibliography in PowerPoint.	Oral evaluation	40%
Other activities	-	-	-

Course coordinator: S. Lect. Eng. Biol. PhD. Boldura Oana-Maria
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