

UNIVERSITY OF ZAGREB
FACULTY OF VETERINARY MEDICINE
Division for Basic and Preclinical Sciences
Department of Pathophysiology
Heinzelova 55, 10000 Zagreb
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Zagreb, 30th January 2023

COURSE SYLLABUS

Course name: Pathophysiology II

Academic year 2022-2023

Course leader: Full Prof. Romana Turk, rturk@vef.unizg.hr

Course vice-leader: Prof. Maja Belić, mbelic@vef.unizg.hr

Teachers: Full Prof. Mirna Robić, Full Prof. Romana Turk, Prof. Maja Belić, Siniša Faraguna, DVM

Associate: Sandra Kunštek, M.Sc. Biotech.

First day of classes: 17th April 2023

Last day of classes: 16th June 2023

Timetable for LECTURES academic year 2022-2023

LECTURES				
Date	Methodological unit	Teacher	Location / time	Literature
MONDAY 17/4/2023	Metabolic disturbances: blood glucose homeostasis, hyperglycemia, hypoglycemia of piglets, ketosis	Prof. Mirna Robić	Lecture Room Physiology 12-14h	See obligatory and optional literature list
THURSDAY 20/4/2023	Metabolic disturbances: starvation, disturbances in fatty acids, triglycerides and cholesterol metabolism	Prof. Mirna Robić	Lecture Room Physiology 8-10h	See obligatory and optional literature list
TUESDAY 25/4/2023	Metabolic disturbances: lipids in blood and mechanisms of atherosclerosis development, Monday morning disease pathogenesis	Prof. Mirna Robić	Lecture Room Physiology 8-9h	See obligatory and optional literature list
TUESDAY 25/4/2023	Liver and biliary system: disturbances in biotransformation mechanisms in liver, disturbances in bilirubin metabolism, mechanisms of icterus development	Prof. Romana Turk	Lecture Room Physiology 9-10h	See obligatory and optional literature list
FRIDAY 28/4/2023	Liver and biliary system: mechanisms of fatty liver development	Prof. Romana Turk	Practical Hall Pathophysiology 10-12h	See obligatory and optional literature list
THURSDAY 4/5/2023	Liver and biliary system: mechanisms of ascites development	Prof. Romana Turk	Lecture Room Physiology 12-14h	See obligatory and optional literature list
TUESDAY 9/5/2023	Disturbances in forestomach digestion; disturbances in ruminal microflora balance, pathogenesis of ruminal acidosis and alkalosis	Prof. Maja Belić	Lecture Room Physiology 12-14h	See obligatory and optional literature list
WEDNESDAY 10/5/2023	Disturbances in forestomach digestion; pathogenesis of traumatic reticuloperitonitis, disturbances in eructation and pathogenesis of ruminal tympany	Prof. Maja Belić	Lecture Room Physiology 12-14h	See obligatory and optional literature list

THURSDAY 11/5/2023	Disturbances in stomach digestion: disturbances in gastric peristaltic and secretion, gastric ulcer, acute gastric dilatation in dogs and horses	Prof. Maja Belić	Lecture Room Physiology 14-16h	See obligatory and optional literature list
FRIDAY 12/5/2023	Disturbances in motoric function of small intestine, malabsorption, diarrhea, constipation	Prof. Maja Belić	Lecture Room Physiology 8-10h	See obligatory and optional literature list
MONDAY 15/5/2023	Disturbances in intestinal passage, ileus, enteritis, disorders in pancreatic juice secretion, intestinal digestion in horses	Prof. Maja Belić	Lecture Room Physiology 14-16h	See obligatory and optional literature list
WEDNESDAY 17/5/2023	Hematopoietic system: complete blood count, classification of anemias, hemolytic anemia	Prof. Maja Belić	Lecture Room Physiology 14-16h	See obligatory and optional literature list
MONDAY 22/5/2023	Hematopoietic system: nutritional deficiency anemia, anemia of inflammatory disease, anemia of renal disease, anemia caused by primary bone marrow diseases	Prof. Maja Belić	Lecture Room Physiology 11-13h	See obligatory and optional literature list
TUESDAY 23/5/2023	Disturbances in heart function: hemodynamics and regulatory factors, disturbances in impulses generation in heart, pathogenesis and forms of bradycardia and tachycardia, extrasystoles	Prof. Mirna Robić	Lecture Room Physiology 8-10h	See obligatory and optional literature list
WEDNESDAY 24/5/2023	Disturbances in heart function: valvular heart disease, cardiac hypertrophy, dilatation and decompensation, heart failure	Prof. Romana Turk	Lecture Room Physiology 13-15h	See obligatory and optional literature list
THURSDAY 25/5/2023	Disturbances in heart function: valvular heart disease, cardiac hypertrophy, dilatation and decompensation, heart failure	Prof. Romana Turk	Lecture Room Physiology 10-11h	See obligatory and optional literature list
THURSDAY 25/5/2023	Pathophysiology of shock	Prof. Mirna Robić	Lecture Room Physiology	See obligatory and optional literature list

			11-12h	
FRIDAY 26/5/2023	Disturbances in fluid and circulation transportation, cardiogenic and non-cardiogenic pulmonary edema, atelectasis, disturbances in breathing frequency and volume	Prof. Mirna Robić	Lecture Room Physiology 8-10h	See obligatory and optional literature list
WEDNESDAY 31/5/2023	Pulmonary volumes and capacities, protective mechanisms of respiratory tract, disturbances in alveolar ventilation, asthma, chronic bronchitis, lung emphysema	Prof. Mirna Robić	Lecture Room Physiology 10-11h	See obligatory and optional literature list
WEDNESDAY 31/5/2023	Pathophysiology of renal diseases: regulation of renal mechanisms, classification of prerenal, renal and postrenal diseases. Prerenal disorders of kidney function	Prof. Romana Turk	Lecture Room Physiology 11-12h	
THURSDAY 1/6/2023	Pathophysiology of renal diseases: glomerular, vascular and tubulointerstitial kidney diseases, acute and chronic kidney insufficiency, uremic syndrome, nephrotic syndrome	Prof. Romana Turk	Practical Hall Pathophysiology 10-12h	See obligatory and optional literature list
WEDNESDAY 7/6/2023	Coagulation disorders: primary and secondary hemostasis disorders; thrombocytopenia, von Willebrandt disease, DIC	Prof. Romana Turk	Lecture Room Physiology 12-14h	See obligatory and optional literature list

Timetable for SEMINARS academic year 2022-2023

SEMINARS					
Date	Methodological unit	Teacher	Group	Location / time	Literature
TUESDAY 13/6/2023	Individual presentation of selected themes	Prof. Mirna Robić	1,2,3	Lecture Room Physiology 8-10h	Printed and electronic teaching materials
WEDNESDAY 14/6/2023	Individual presentation of selected themes	Prof. Romana Turk	1,2,3	Lecture Room Physiology 14-16h	Printed and electronic teaching materials
THURSDAY 15/6/2023	Individual presentation of selected themes	Prof. Maja Belić	1,2,3	Lecture Room Physiology 14-16h	Printed and electronic teaching materials

Timetable for PRACTICALS academic year 2022-2023

PRACTICALS						
Date	Methodological unit	Teacher	Type of practical	Group	Location / time	Literature
FRIDAY 21/4/2023	Disorders of lipid metabolism	Prof. Romana Turk	Clinical practicals	1,2,3	Practical Room, Department of Pathophysiology 10-12h	Printed and electronic teaching materials
WEDNESDAY 26/4/2023	Clinical enzymology: diagnostic significance of serum enzyme activities	Siniša Faraguna, DVM	Clinical practicals	1,2,3	Practical Room, Department of Pathophysiology 14-16h	Printed and electronic teaching materials
THURSDAY 4/5/2023	Disorders of bilirubin metabolism: differential diagnostic of icterus, determination of serum bilirubin concentration	Prof. Maja Belić	Clinical practicals	1,2,3	Practical Room, Department of Pathophysiology 14-16h	Printed and electronic teaching materials
FRIDAY 5/5/2023	Laboratory diagnostics of cerebrospinal fluid	Prof. Maja Belić	Constructive practicals	1,2,3	Practical Room, Department of Pathophysiology 8-10h	Printed and electronic teaching materials
TUESDAY 9/5/2023	Urine analysis and interpretation	Siniša Faraguna, DVM	Clinical practicals	1,2,3	Practical Room, Department of Pathophysiology 8-10h	Printed and electronic teaching materials
WEDNESDAY 10/5/2023	Colloquium: diagnostic significance of serum and urine analysis Hematopoietic system: blood cell maturation in bone marrow	Prof. Mirna Robić	Constructive practicals	1,2,3	Practical Room, Department of Pathophysiology 14-16h	Printed and electronic teaching materials W.J. Reagan: Veterinary Hematology, Atlas of Common Domestic Species

THUESDAY 11/5/2023	Hematological analyses and its application in disease recognition. Methods of blood cells counting, determination of erythrocyte number	Siniša Faraguna, DVM	Clinical practicals	1,2,3	Practical Room, Department of Pathophysiology 12-14h	Printed and electronic teaching materials
FRIDAY 12/5/2023	Determination of erythrocyte sedimentation rate, hemoglobin concentration and PCV: diagnostic significance in pathophysiological conditions. Calculation of erythrocyte indices and morphological classification of anemia	Siniša Faraguna, DVM	Clinical practicals	1,2,3	Practical Room, Department of Pathophysiology 10-12h	Printed and electronic teaching materials
MONDAY 15/5/2023	Determination of reticulocyte count, its diagnostic significance, classification of regenerative and non-regenerative anemia	Prof. Romana Turk	Clinical practicals	1,2,3	Practical Room, Department of Pathophysiology 12-14h	Printed and electronic teaching materials
TUESDAY 16/5/2023	Leukopoiesis, function of leukocytes	Prof. Mirna Robić	Constructive practicals	1,2,3	Practical Room, Department of Pathophysiology 8-10h	Printed and electronic teaching materials
WEDNESDAY 17/5/2023	Determination of total leukocyte count, diagnostic significance of changes in total leukocytes count	Siniša Faraguna, DVM		1,2,3	Practical Room, Department of Pathophysiology 10-12h	Printed and electronic teaching materials W.J. Reagan: Veterinary Hematology, Atlas of Common Domestic Species

THURSDAY 18/5/2023	Determination of absolute eosinophil count, diagnostic significance of changes of eosinophil count	Siniša Faraguna, DVM	Clinical practicals	1,2,3	Practical Room, Department of Pathophysiology 13-15h	Printed and electronic teaching materials W.J. Reagan: Veterinary Hematology, Atlas of Common Domestic Species
FRIDAY 19/5/2023	Differential leukocyte count, blood smear making and staining	Siniša Faraguna, DVM	Clinical practicals	1,2,3	Practical Room, Department of Pathophysiology 10-12h	Printed and electronic teaching materials
MONDAY 22/5/2023	Determination of differential leukocyte count, diagnostic significance of qualitative and quantitative changes	Prof. Mirna Robić	Clinical practicals	1,2,3	Practical Room, Department of Pathophysiology 13-15h	Printed and electronic teaching materials
TUESDAY 23/5/2023	Morphologic changes of RBC and their diagnostic significance	Prof. Romana Turk	Clinical practicals	1,2,3	Practical Room, Department of Pathophysiology 10-12h	Printed and electronic teaching materials W.J. Reagan: Veterinary Hematology, Atlas of Common Domestic Species
WEDNESDAY 24/5/2023	Interpretation of leukogram changes in different animal species	Prof. Mirna Robić	Clinical practicals	1,2,3	Practical Room, Department of Pathophysiology 8-10h	Printed and electronic teaching materials
THURSDAY 25/5/2023	Morphology changes of RBC and WBC in blood smear	Prof. Romana Turk	Constructive practicals	1,2,3	Practical Room, Department of Pathophysiology 12-14h	Printed and electronic teaching materials
FRIDAY 26/5/2023	Hematology of reptiles	Prof. Maja Belić	Clinical practicals	1,2,3	Practical Room, Department of Pathophysiology 13-15h	Printed and electronic teaching materials W.J. Reagan: Veterinary Hematology, Atlas of

						Common Domestic Species
WEDNESDAY 31/5/2023	Hematology of birds	Prof. Maja Belić	Clinical practicals	1,2,3	Practical Room, Department of Pathophysiology 12-14h	Printed and electronic teaching materials
THURSDAY 1/6/2023	Bone marrow smear examination	Siniša Faraguna, DVM	Clinical practicals	1,2,3	Practical Room, Department of Pathophysiology 12-14h	Printed and electronic teaching materials
FRIDAY 2/6/2023	Neoplastic diseases of hematopoietic system	Siniša Faraguna, DVM	Clinical practicals	1,2,3	Practical Room, Department of Pathophysiology 8-10h	Printed and electronic teaching materials
MONDAY 5/6/2023	Practical colloquium: recognition of blood cells and morphology changes of blood cells	Siniša Faraguna, DVM	Constructive practicals	1,2,3	Practical Room, Department of Pathophysiology 8-10h	Printed and electronic teaching materials
TUESDAY 6/6/2023	Laboratory diagnostics of disorders of hemostasis	Siniša Faraguna, DVM	Clinical practicals	1,2,3	Practical Room, Department of Pathophysiology 8-10h	Printed and electronic teaching materials
MONDAY 12/6/2023	Laboratory diagnostics of kidney diseases	Prof. Maja Belić	Clinical practicals	1,2,3	Practical Room, Department of Pathophysiology 10-12h	Printed and electronic teaching materials
WEDNESDAY 14/6/2023	Interpretation of hematological and biochemical laboratory findings Colloquium: diagnostic significance of qualitative and quantitative changes of hemogram	Prof. Maja Belić Prof. Romana Turk	Constructive practicals	1,2,3	Practical Room, Department of Pathophysiology 12-14h	Printed and electronic teaching materials

STUDENT OBLIGATIONS

Lecture attendance	Student must be present at least 20 hours of lectures to gain minimal 3 points. For each excused absence student will get back 0.154 points per hour. Maximal number of points for lecture attendance is 6 points.
Seminars attendance	Student must be present at least 5 hours of seminars to gain minimal four points. Each excused absence student can make up in agreement with seminar leader in written form and the points for attendance could be regained. Student can achieve maximum 6 points for seminar attendance.
Practicals attendance	Student must be present at least 40 hours of practicals to achieve minimal 5.2 points. Each excused absence within the limit (10 hours, i.e. 5 programs) student can make up in agreement with practical leader and 0.13 points per hour could be regain. Maximal number of points, which can be achieved from practical attendance, is 6 points.
Active participation in seminars and practicals	Each attended, written and signed practical results in 0.2 points, finally maximal 5 points (25 programs x 0.2 = 5). During practicals, short oral knowledge checking will be performed and that maximal 2.5 points can be gained. During seminars student should prepare oral presentation with PowerPoint presentation of given topics and that way can gain maximal 2.5 points.
Final exam	The final exam begins with result analysis of each evaluation element. For final exam attendance, student must gain minimum 16 points from attendance and activity on lectures, seminars and practicals, and minimal 20 points from continuous knowledge checking. Regardless to the final sumo of gained points until final exam, student must show sufficient knowledge at final exam. Minimal number of points which can be gained at final exam is 24, maximal is 40. If student did not show sufficient knowledge at final exam, she/he can access the exam in the next term. Final mark is formed based on total number of points from all elements of evaluation.
Examination requirements	Student requirements are defined in the Regulations on the Integrated Undergraduate and Graduate Study of Veterinary Medicine. Given the above, the student must acquire a minimum number of points from all assessment elements in order to take the final exam. Article 45: a student can justifiably be absent from up to 50 % of the lectures; 20 % of the seminars and 20 % of the practicals.

GRADING AND EVALUATING STUDENT WORK

Continuous knowledge-checking (colloquium)	<p>Three are 2 written and 1 practical colloquiums that will be performed in regular practicals terms:</p> <ol style="list-style-type: none"> 1. Written test from biochemical practicals contains 6 questions. Each correct answer is worth 2 points. Maximal 12 points can be achieved. Minimal 7 points are required. 2. Written test from hematological practicals contains 16 questions. Each correct answer is worth one point. Maximal 16 points can be achieved. Minimal 10 points are required. 3. Practical colloquium includes recognition blood cells and their morphology changes on the blood smear. Maximal 4 points can be achieved. Minimal 3 points are required. <p>A total score from all 3 colloquiums is 32 points. Minimal 20 points are required.</p> <p>For students who do not achieve minimal number of points from each colloquium, three additional terms will be organized during the academic year. Students who do not pass colloquiums in current academic year will lose the possibility to attend the colloquiums and must re-enroll the course to gain sufficient knowledge and possibility to attend the colloquiums in the following academic year.</p> <p>Dates of colloquiums 10/5/23, 5/6/23, 14/6/23</p>
Final exams (dates)	19/6/2023, 10/7/2023, 7/9/2023, 22/9/2023
Form of final exam	oral

LITERATURE

Obligatory literature	<p>DUNLOP, R. H., C.-H. MALBERT (2004): Veterinary Pathophysiology, Blackwell Publishing, Ames, Iowa.</p> <p>FELDMAN, B. F., J. G. ZINKL, N. C. JAIN (2000): Schalm's Veterinary Hematology. Lippincott Williams and Wilkins, Philadelphia, Baltimore, New York, London, Buenos Aires, Hong Kong, Sydney, Tokyo.</p> <p>SLAUSON, D. O., B. J. COOPER (2002): Mechanism of Disease. Mosby, St. Louis, London, Philadelphia, Sydney, Toronto.</p> <p>HANSEN, M. (1998): Pathophysiology. Foundations of disease and Clinical Intervention. Saunders company, USA.</p> <p>E-learning materials</p>
Optional literature	

OBJECTIVES AND LEARNING OUTCOMES

Course objectives	<p>The course objective is gaining knowledge on mechanisms involved in development of pathophysiological processes in individual organs and organ systems on molecular and cellular level and tissue and organs levels which provides understanding the course of disease and basis for understanding clinical courses. Overall consideration of pathophysiological mechanisms enables students to develop sense for integrative approach to pathological process at the whole organism level. In addition, the objective of the course is to develop skills in laboratory diagnostic of pathological processes and interpretation of changes in laboratory findings that could help in diagnosis of diseases.</p>
Learning outcomes	<p>After successful mastering, student will be able to describe digestive system pathophysiology, describe disturbances in hepatic and biliary function, define disturbances in carbohydrate, fat and protein metabolism, describe renal diseases pathophysiology, describe disturbances in blood and hematological system functions and heart diseases, and describe disturbances in respiratory system functions. In addition, students will gain skills in performing biochemical and hematological laboratory diagnostics and interpretation of laboratory findings to be used in understanding the mechanisms and course of pathological process.</p>

GRADING SCHEME

<i>Points</i>	<i>Grade</i>
Up to 59	1 (F)
60-68	2 (E)
69-76	2 (D)
77-84	3 (C)
85-92	4 (B)
93-100	5 (A)

Course leader:



Full Prof. Romana Turk

Head of organizational unit:



Prof. Maja Belic

Note: The course leader is required to submit a Course Syllabus to all teachers and associates pertaining to the Course