UNIVERSITY OF ZAGREB
FACULTY OF VETERINARY MEDICINE
Heinzelova 55
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Division of Veterinary Public Health and Food Safety
Unit of Pharmacology and Toxicology
Email: apcrnic@vef.hr
Register no.:
Zagreb, 3/2/2022

COURSE SYLLABUS

TOXICOLOGY

Academic year 2022/2023

Course leader:
Full Prof. Andreja Prevendar Crnić, DVM, PhD
Teachers:
Full Prof. Andreja Prevendar Crnić, DVM, PhD
Teaching assistant Ena Oster, DVM
Teaching assistant Nikola Čudina, DVM
Associate teachers:
Dr Maja Lang Balija, DVM PhD

First day of classes: 28/3/2023
Last day of classes: 26/5/2023

Timetable for LECTURES academic year 2022/2023

LECTURES				
Date	**Methodological unit**	**Teacher**	**Location / Time**	**Literature**
28/3/2023 1st lecture	Introduction to veterinary toxicology. Definitions and professional terminology in toxicology; Toxicity. Possible sources of animal poisoning, factors influencing toxicity and the occurrence of poisoning	Prof Andreja Prevendar Crnić	Lecture room Pharmacology and Toxicology (10am-12pm)	GUPTA, R.C. (2012): Veterinary Toxicology: Basic and Clinical Principles. 2nd ed., Elsevier, Cambridge, Kidlington, London, San Diego V. BEASLEY (2004): Veterinary toxicology, University of Illinois, Illinois (Accessible at https://www.ivis.org/library/veterinary-toxicology) OSWEILER, G.D. (1996): Toxicology, Williams & Wilkins Philadelphia, Baltimore
30/3/2023 2nd lecture	Pesticides: organophosphorus compounds, carbamates	Prof Andreja Prevendar Crnić	Lecture room Pharmacology and Toxicology (10am-12pm)	GUPTA, R.C. (2012): Veterinary Toxicology: Basic and Clinical Principles. 2nd ed., Elsevier, Cambridge, Kidlington, London, San Diego V. BEASLEY (2004): Veterinary toxicology, University of Illinois, Illinois (Accessible at https://www.ivis.org/library/veterinary-toxicology) OSWEILER, G.D. (1996): Toxicology, Williams & Wilkins Philadelphia, Baltimore
3/4/2023 3rd lecture	Pyrethrin and pyrethroids, macrocyclic lactones, fipronil, neonicotinoids, strychnine	Prof Andreja Prevendar Crnić	Lecture room Pharmacology and Toxicology (3,15pm-4,45pm)	GUPTA, R.C. (2012): Veterinary Toxicology: Basic and Clinical Principles. 2nd ed., Elsevier, Cambridge, Kidlington, London, San Diego V. BEASLEY (2004): Veterinary toxicology, University of Illinois, Illinois (Accessible at https://www.ivis.org/library/veterinary-toxicology) OSWEILER, G.D. (1996): Toxicology, Williams & Wilkins Philadelphia, Baltimore
14/4/2023 4th lecture	Anticoagulants, vitamin D, phosphides, metaldehyde, dipyridyls	Prof Andreja Prevendar Crnić	Lecture room Pharmacology and Toxicology (10,30am-12pm)	GUPTA, R.C. (2012): Veterinary Toxicology: Basic and Clinical Principles. 2nd ed., Elsevier, Cambridge, Kidlington, London, San Diego V. BEASLEY (2004): Veterinary toxicology, University of Illinois, Illinois (Accessible at https://www.ivis.org/library/veterinary-

				toxicology) OSWEILER, G.D. (1996): Toxicology, Williams & Wilkins Philadelphia, Baltimore
17/4/2023 5th lecture	Heavy metals - Introduction Poisoning of domestic animals with mercury, copper, iron, and zinc	Prof Andreja Prevendar Crnić	Lecture room Pharmacology and Toxicology (12pm-2pm)	GUPTA, R.C. (2012): Veterinary Toxicology: Basic and Clinical Principles. 2nd ed., Elsevier, Cambridge, Kidlington, London, San Diego V. BEASLEY (2004): Veterinary toxicology, University of Illinois, Illinois (Accessible at https://www.ivis.org/library/veterinary-toxicology) OSWEILER, G.D. (1996): Toxicology, Williams & Wilkins Philadelphia, Baltimore
18/4/2023 6th lecture	Poisoning of domestic animals with lead, cadmium, arsenic, and selenium	Prof Andreja Prevendar Crnić	Lecture room Pharmacology and Toxicology (8am-10am)	GUPTA, R.C. (2012): Veterinary Toxicology: Basic and Clinical Principles. 2nd ed., Elsevier, Cambridge, Kidlington, London, San Diego V. BEASLEY (2004): Veterinary toxicology, University of Illinois, Illinois (Accessible at https://www.ivis.org/library/veterinary-toxicology) OSWEILER, G.D. (1996): Toxicology, Williams & Wilkins Philadelphia, Baltimore
19/4/2023 7th lecture	Mycotoxicoses Introduction, hepatotoxins, nephrotoxins, trichothecenes	Prof Andreja Prevendar Crnić	Lecture room Pharmacology and Toxicology (10am-12pm)	GUPTA, R.C. (2012): Veterinary Toxicology: Basic and Clinical Principles. 2nd ed., Elsevier, Cambridge, Kidlington, London, San Diego V. BEASLEY (2004): Veterinary toxicology, University of Illinois, Illinois (Accessible at https://www.ivis.org/library/veterinary-toxicology) OSWEILER, G.D. (1996): Toxicology, Williams & Wilkins Philadelphia, Baltimore
25/4/2023 8th lecture	Mycotoxicoses Fumonisins, estrogen mycotoxins (zearelenone, ergot alkaloids), tremorgenic mycotoxins	Prof Andreja Prevendar Crnić	Lecture room Pharmacology and Toxicology (10,30am-12pm)	GUPTA, R.C. (2012): Veterinary Toxicology: Basic and Clinical Principles. 2nd ed., Elsevier, Cambridge, Kidlington, London, San Diego V. BEASLEY (2004): Veterinary toxicology, University of Illinois, Illinois (Accessible at https://www.ivis.org/library/veterinary-toxicology) OSWEILER, G.D. (1996): Toxicology, Williams & Wilkins Philadelphia, Baltimore

26/4/2023 9th lecture	Poisoning of domestic animals with fluorine, cyanides, and cyanogen plants	Prof Andreja Prevendar Crnić	Lecture room Pharmacology and Toxicology (12am-2pm)	GUPTA, R.C. (2012): Veterinary Toxicology: Basic and Clinical Principles. 2nd ed., Elsevier, Cambridge, Kidlington, London, San Diego V. BEASLEY (2004): Veterinary toxicology, University of Illinois, Illinois (Accessible at https://www.ivis.org/library/veterinary-toxicology) OSWEILER, G.D. (1996): Toxicology, Williams & Wilkins Philadelphia, Baltimore
27/4/2023 10th lecture	Ammonium salts, nitrates, nitrites, nitroso compounds Poisoning of domestic animals with urea	Prof Andreja Prevendar Crnić	Lecture room Pharmacology and Toxicology (8am-10am)	GUPTA, R.C. (2012): Veterinary Toxicology: Basic and Clinical Principles. 2nd ed., Elsevier, Cambridge, Kidlington, London, San Diego V. BEASLEY (2004): Veterinary toxicology, University of Illinois, Illinois (Accessible at https://www.ivis.org/library/veterinary-toxicology) OSWEILER, G.D. (1996): Toxicology, Williams & Wilkins Philadelphia, Baltimore
28/4/2023 11th lecture	Poisoning of domestic animals with sodium chloride, ethylene glycol, fruit, chocolate, coffee, and substances from the immediate environment	Prof Andreja Prevendar Crnić	Lecture room Pharmacology and Toxicology (10am-12pm)	GUPTA, R.C. (2012): Veterinary Toxicology: Basic and Clinical Principles. 2nd ed., Elsevier, Cambridge, Kidlington, London, San Diego V. BEASLEY (2004): Veterinary toxicology, University of Illinois, Illinois (Accessible at https://www.ivis.org/library/veterinary-toxicology) OSWEILER, G.D. (1996): Toxicology, Williams & Wilkins Philadelphia, Baltimore
8/5/2023 12th lecture	Antitoxin production - presentation by Dr. Maja Lang Balija	Prof Andreja Prevendar Crnić	Lecture room Pharmacology and Toxicology (12pm-2pm)	Work material

Timetable for SEMINARS academic year 2022/2023

SEMINARS					
Date	**Methodological unit**	**Teacher**	**Group**	**Location / time**	**Literature**
15/5/2023 1st seminar	Clinical toxicology of snake bites Clinical toxicology of stings and bites of some ticks and spiders	Prof Andreja Prevendar Crnić Ena Oster, DVM	1,2	Lecture room Pharmacology and Toxicology (9am-11am)	Work material
17/5/2023 2nd seminar	Clinical Toxicology of Hymenoptera bites and contact with oak processionary Nanoparticle toxicology	Prof Andreja Prevendar Crnić Ena Oster, DVM	1,2	Lecture room Pharmacology and Toxicology (2pm-4pm)	Work material
23/5/2023 3rd seminar	Polychlorinated biphenyls Dioxins Polycyclic aromatic hydrocarbons (PAHs), brominated flame retardants and perfluorinated substances	Prof Andreja Prevendar Crnić Nikola Čudina, DVM	1,2	Lecture room Pharmacology and Toxicology (8am-10am)	Work material

Timetable for PRACTICALS academic year 2022/2023

PRACTICALS						
Date	**Methodological unit**	**Teacher**	**Type of practical** (Article 31. of Regulation)	**Group**	**Location / time**	**Literature**
5/4/2023 1st practical	Introduction Treatment of poisoned animals Diagnosis of poisoning	Ena Oster, DVM Nikola Čudina, DVM	Practicum	1,2	Lecture room Pharmacology and Toxicology (8am-10am)	Work material
12/4/2023 2nd practical	Fundamentals of instrumental quantitative laboratory analytics in toxicology Qualitative tests for pesticides determination in biological samples	Ena Oster, DVM Nikola Čudina, DVM	Practicum / Laboratory practicals	1,2	Lecture room Pharmacology and Toxicology (10,15am-12pm)	Work material
14/4/2023 3rd practical	Ecotoxicology Chemical and biological weapons in the context of veterinary toxicology	Ena Oster, DVM Nikola Čudina, DVM	Practicum	1,2	Lecture room Pharmacology and Toxicology (12pm-2pm)	Work material
17/4/2023 4th practical	Mycotoxin analytics Qualitative tests for determination of heavy metals, industrial pollutants, and nitrogen compounds in biological samples	Ena Oster, DVM Nikola Čudina, DVM	Practicum / Laboratory practicals	1,2	Lecture room Pharmacology and Toxicology (10am-12pm)	Work material
18/4/2023 5th practical	Basic mechanisms of action of toxins	Ena Oster, DVM Nikola Čudina, DVM			Lecture room Pharmacology and Toxicology	Work material

	Treatment of poisoned animals		Practicum	1,2	(2pm-4pm)	
25/4/2023 6th practical	Organotoxicology I colloquium	Ena Oster, DVM Nikola Čudina, DVM	Practicum	1,2	Lecture room Pharmacology and Toxicology (12pm-2pm)	GUPTA, R.C. (2012): Veterinary Toxicology: Basic and Clinical Principles. 2nd ed., Elsevier, Cambridge, Kidlington, London, San Diego V. BEASLEY (2004): Veterinary toxicology, University of Illinois, Illinois (Accessible at https://www.ivis.org/library/veterinary-toxicology)
26/4/2023 7th practical	Toxicoses of fish Toxicoses of birds I	Ena Oster, DVM Nikola Čudina, DVM	Practicum	1,2	Lecture room Pharmacology and Toxicology (10am-12am)	GUPTA, R.C. (2012): Veterinary Toxicology: Basic and Clinical Principles. 2nd ed., Elsevier, Cambridge, Kidlington, London, San Diego V. BEASLEY (2004): Veterinary toxicology, University of Illinois, Illinois (Accessible at https://www.ivis.org/library/veterinary-toxicology)
2/5/2023 8th practical	Toxicoses of birds II Intoxication of pets with drugs of abuse	Ena Oster, DVM Nikola Čudina, DVM	Practicum	1,2	Lecture room Pharmacology and Toxicology (1pm-3pm)	GUPTA, R.C. (2012): Veterinary Toxicology: Basic and Clinical Principles. 2nd ed., Elsevier, Cambridge, Kidlington, London, San Diego V. BEASLEY (2004): Veterinary toxicology, University of Illinois, Illinois (Accessible at https://www.ivis.org/library/veterinary-toxicology) POPPENGA, R.H., S. GWALTNEY-BRANT

						(2011): Small Animal Toxicology Essentials. Wiley-Blackwell, Ames PETERSON, M.E., P.A. TALCOTT (2013): Small Animal Toxicology. Elsevier, St. Louis
4/5/2023 9th practical	Toxic effects of possible toxic substances in the immediate vicinity of pets – the most common poisonings (Reports of the poison control centres) Case reports with discussion I	Ena Oster, DVM Nikola Čudina, DVM	Practicum	1,2	Lecture room Pharmacology and Toxicology (12pm-2pm)	POPPENGA, R.H., S. GWALTNEY-BRANT (2011): Small Animal Toxicology Essentials. Wiley-Blackwell, Ames PETERSON, M.E., P.A. TALCOTT (2013): Small Animal Toxicology. Elsevier, St. Louis
5/5/2023 10th practical	Case reports with discussion II	Ena Oster, DVM Nikola Čudina, DVM	Practicum	1,2	Lecture room Pharmacology and Toxicology (12pm-2pm)	Work material
19/5/2023 11th practical	Case reports with discussion III	Ena Oster, DVM Nikola Čudina, DVM	Practicum	1,2	Lecture room Pharmacology and Toxicology (8am-10am)	Work material
26/5/2023 12th practical	Case reports with discussion IV II colloquium	Ena Oster, DVM Nikola Čudina, DVM	Practicum	1,2	Lecture room Pharmacology and Toxicology (8am-10am)	Work material

STUDENT OBLIGATIONS

Lecture attendance	3-6 points; 1 hour = 0.25 points student must be present for at least 12 hours out of 24
Seminars attendance	5-6 points; 1 hour of seminar brings 1 point student must be present for at least 5 seminars hours out of 6
Practicals attendance	5-6 points; 1 hour = 0.25 points the student must be present for at least 20 hours of practicals out of 24
Active participation in seminars and practicals	5-10 points the highest number of points (5) for the activity on the practicals can be obtained by the student if he shows interest in the topics covered within the practical class and is active in the laboratory; the highest number of points (5) for the activity at the seminars can be obtained by studying the literature for a given topic and presenting the given topic well Students have to obtain at least 2,5 points from practicals and 2,5 points from seminar to gain minimal 5 points total.
Final exam	24-40 points Students first take written part of the exam consisting of five descriptive questions after which they take oral part of the exam.
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 exercises.

GRADING AND EVALUATING STUDENT WORK

Continuous knowledge-checking (mid-terms)	2 colloquia: I. Colloquium: Assessment of knowledge gained during practicals 25/4/2023 during practicals (max. 20 points, min. 12 points) II. Colloquium: Assessment of knowledge gained during seminars 26/5/2023 during practicals (max. 12 points, min. 8 points) Colloquium retakes by appointment
Final exams (dates)	26/6/2023; 5/7/2023; 14/7/2023; 8/9/2023; 18/9/2023
Form of final exam	Written and oral

LITERATURE

Obligatory literature	GUPTA, R.C. (2012): Veterinary Toxicology: Basic and Clinical Principles. 2nd ed., Elsevier, Cambridge, Kidlington, London, San Diego V. BAESLEY (2004): Veterinary toxicology, University of Illinois, Illinois (Accessible at https://www.ivis.org/library/veterinary-toxicology) OSWEILER, G.D. (1996): Toxicology, Williams & Wilkins Philadelphia, Baltimore. POPPENGA, R.H., S. GWALTNEY-BRANT (2011): Small Animal Toxicology Essentials. Wiley-Blackwell, Ames PETERSON, M.E., P.A. TALCOTT (2013): Small Animal Toxicology. Elsevier, St. Louis PP presentations of lectures, exercises and laboratory work
Optional literature	

OBJECTIVES AND LEARNING OUTCOMES

Course objectives	With the knowledge gained at the Toxicology course students will be able to recognize animal poisoning, conduct stabilization, differential diagnosis, and treatment of poisoned patients, assess the success of treatment, and provide for possible wider harmful effects of poisoning (ecotoxicology). Proper sampling and sending materials for toxicological analysis; evaluation of chemical-toxicological test results in case of residues. Within the laboratory exercises for proving toxins in biological samples, students will acquire basic knowledge and skills in analytical toxicology (qualitative and semi-qualitative tests). During the processing of clinical poisoning cases with discussion, students are introduced to clinical toxicology and practice. They will also be able to identify possible sources of pet poisoning among things from their immediate living environment. In addition to poisoning domestic animals and pets, students will gain basic knowledge in the toxicology of birds and fish.
Learning outcomes	After completing the course material and passing the Toxicology exam, the student should know: - recognize poisoning - undertake therapeutic measures - evaluate the success of the therapeutic measures - evaluate possible hazardous consequences produced by the poisoning - identify possible sources of pet poisoning among things from their immediate living environment - professional sampling and transport materials for toxicological analysis - evaluation of the results of chemical toxicological tests in the case of residues according to legislation - identify fish and avian poisoning, and poisoning with venoms and toxins of animals

GRADING SCHEME

Points	*Grade*
Up to 59	1 (F)
60-76	2 (D,E)
77-84	3 (C)
85-92	4 (B)
93-100	5 (A)

Course leader

Full Prof. Andreja Prevendar Crnić, DVM, PhD

Head of organizational unit:

Full Prof. Frane Božić, DVM, PhD

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