

Toxicology

Code: 102663
ECTS Credits: 5

Degree	Type	Year	Semester
2502445 Veterinary Medicine	OB	4	2

Contact

Name: Eva Castells Caballe

Email: eva.castells@uab.cat

Teaching groups languages

You can check it through this [link](#). To consult the language you will need to enter the CODE of the subject. Please note that this information is provisional until 30 November 2023.

Teachers

Angel Bistue Rovira

Prerequisites

It is advisable to have a good knowledge of chemistry, biochemistry, physics, cell biology, physiology, pharmacology and pathology. A good level of English and a critical reading ability of toxicological information (books, review articles, original articles) are also recommended. In order to be able to attend the sessions of laboratory practices, the student must justify having passed the biosafety and security tests that he/she will find in the Virtual Campus and accept the operation regulations of the laboratories of the Faculty of Veterinary Medicine.

Objectives and Contextualisation

Toxicology is a fundamental subject in the second semester of the 4th year of the Veterinary Medicine Degree, and part of the subject Pharmacology, Toxicology and Therapeutics. Its objective is to provide the basic knowledge of what is currently the science of toxicology, specifically the fundamental toxicological principles (experimental toxicology, analytical toxicology and regulatory toxicology) and in the important branches of environmental toxicology (= pollutants) and of veterinary clinical toxicology (= diagnosis and treatment of poisonings, including the use of antidotes). The specific study of the main toxic agents that affect or can affect the health of animals, both domestic and wild, or contaminate food, such as gases and volatiles, metals and non-metals, ionizing radiation, pesticides, products for domestic and industrial use, and toxins, is also carried out. The approach is multifaceted, useful for veterinarians who end up dedicating themselves to clinic but also to those who will work on production and animal health, food safety, R & D or biomedical research.

Competences

- Demonstrate knowledge and understanding of the general bases of medical and surgical treatments.
- Draft and present satisfactory professional reports, always maintaining the required confidentiality.
- Perform basic analytical techniques and interpret the clinical, biological and chemical results, and interpret the results of tests generated by other laboratories.
- Perform the most common medical and surgical treatments of animals.
- Prescribe and dispense medicines correctly and responsibly in accordance with legislation, and ensure that the medicines and waste are stored and eliminated properly.
- Work effectively in single or multidisciplinary teams and show respect, appreciation and sensitivity for the work of others.

Learning Outcomes

1. Critically evaluate data on the circumstances of intoxication or poisoning, the signs and symptoms, pathology and others, which should lead to a diagnosis and the establishment of treatment guidelines for the intoxicated patient or patients.
2. Define the general and specific bases for the treatment of intoxications.
3. Describe the fundamental principles that govern experimental and analytical toxicology.
4. Draft and present satisfactory professional reports, always maintaining the required confidentiality.
5. Identify and interpret the legislation affecting medicinal waste in foods.
6. Identify and interpret the phases of drug development and know the bodies involved in their development and authorisation.
7. Recognise and identify the different available antidotes and plan their use in cases of intoxication in domestic and wild animals, as well as decontamination techniques.
8. Recognise and identify the main toxic agents that contaminate, impregnate or intoxicate wild and domesticated animals and, in particular, gaseous and volatile agents, metals and non-metals, pesticides, products for domestic and industrial use and toxins, and their possible accidental or deliberate presence in water or foods.
9. Select, collect and issue samples to perform toxicological analyses and draft the corresponding reports for the receiver laboratory.
10. Use the basic preparatory and analytical techniques of a toxicology laboratory, applying at all times basic safety and risk prevention standards, and draft the corresponding assessment report.
11. Work effectively in single or multidisciplinary teams and show respect, appreciation and sensitivity for the work of others.

Content

THEORY*

Toxicology syllabus (Veterinary Medicine, Course 22_23)

Bloc A. Introduction to general toxicology

Lesson 1. General concepts of toxicology. Fields of study of toxicology. One Health perspective. Exposure vs effects. Origin of toxic substances. Some basics about toxicology. Most frequent poisonings in pets, wildlife, production animals. Toxic substances present in food.

Lesson 2. Basic principles of toxicology. Definition of toxicity. Factors that determine toxicity: characteristics of the substance, the organism and the environment.

Bloc B. Toxic substances

Lesson 3. Pesticides. Organochlorine insecticides. Anticholinesterasic insecticides (organophosphates and carbamates). Pyrethroids. Neonicotinoids. Rodenticides, anticoagulants and convulsants. Herbicides (glyphosate, paraquat).

Lesson 4. Industrial pollutants and metals. POP. Dioxins. PBDE. Metals: Pb, Cd, Hg, As

Lesson 5. Phytotoxins Cyanogenetic plants, plants containing oxalates, tannins, estrogen, glucosinolates, nitrites and nitrates. Neurotoxic (theobromine, caffeine) and hepatotoxic (pyrrolizidine alkaloids) alkaloids. Other plants that cause poisoning: cycas, cannabis, onions, garlic, grapes.

Lesson 6. Mycotoxins Aflatoxins, ochratoxins, fumonisins, ergot alkaloids.

Lesson 7. Animal toxins. Marine toxins. Venoms of snakes, insects and arachnids.

Bloc C. Phases of toxicity: from exposure to effects

Lesson 8. Environmental toxicology. Distribution and transport of pollutants by the abiotic environment. Transport in fluids. Bioaccessibility. Pollutant behaviour prediction, physicochemical properties and partition coefficients H' , K_{oc} .

Lesson 9. Toxicokinetics (I). Absorption and metabolism. Dose and internal exposure. Absorption. Types of cell transport. Routes of exposure. Absorption rates. Distribution. Pre-systemic elimination. Plasma proteins. Accumulation and remobilization. Metabolism. Phases I and II of metabolism. Characteristics of metabolism: specificity, induction and inhibition. Detoxification and metabolic activation.

Lesson 10. Toxicokinetics (II). Bioaccumulation and excretion. Concept of biological half-life. Bioaccumulation in tissues. Excretion. Relationship between metabolism and excretion. Biomagnification.

Lesson 11. Toxicodynamics (I). Types of toxic effects. Classification of effects according to temporality (acute, subchronic, chronic). Toxicity at the molecular level. Toxicity in organs and systems: nervous system, respiratory system, cardiovascular system, hepatotoxicity, renal system.

Lesson 12. Toxicodynamics (II). Genotoxicity. Carcinogenesis. Teratogenesis. Endocrine disruptors.

Bloc D. Veterinary clinical toxicology

Lesson 13. Diagnosis of poisonings. Medical history. Sampling in toxicology. General diagnosis of poisonings. Toxic syndromes. Diagnostic tests.

Lesson 14. Analytical toxicology. Chemical and biological monitoring. Phases of chemical monitoring: pre-analytical, analytical and post-analytical. Extraction, purification and determination of an analyte. Chromatography. Calculation of concentrations. Interpretation of toxicological analysis. Reference centres and laboratories of interest in Toxicology.

Lesson 15. Treatment of poisonings. Decontamination. General guidelines for the treatment of an intoxicated animal. Measures to prevent the absorption of the toxic substance. Symptomatic treatment. Classification of antidotes according to their mechanism of action.

Bloc E. Evaluation of toxicity

Lesson 16. Experimental toxicology. Models for assessing toxicity. Theoretical estimates. In vitro studies. In vivo studies. Epidemiological studies. Risk communication. toxicological. Globally Harmonized System (GHS). Labelling of chemical products and safety data sheets.

Lesson 17. Quantitative toxicology. Dose and concentration concept. Type of response. Acute toxicity index (LD₅₀, CL₅₀). Subchronic (NOAEL, LOAEL, BMDL) and chronic toxicity index. Maximum exposure limits (ADI, TDI, RfD). Uncertainty factors. Maximum permissible concentrations (MRL). Characterization of toxicological risk.

Lesson 18. Food toxicology. Toxins present in food and food safety. RASFF alert system.

CLASSROOM PRACTICES (PAUL)/SEMINARS*

- Search for toxicological information in open access databases
- Clinical cases of poisoning in horses, dogs and wild boar
- Clinical cases in farm animals and poisonings from consumption of contaminated food
- Tutorials and discussion, poster production

LABORATORY PRACTICES (PLAB)*

- Determination of convulsant rodenticides in a poisoned bait
- Determination of acetylcholinesterase activity in pesticide poisoning
- Identification of toxic plants (campus exit) and rapid determinations of phytotoxins

Methodology

Theory*. The teacher will explain much of the contents of the syllabus with the support of visual material that will be available to the students in the Moodle/Virtual Campus. These keynote sessions will deal with the main topics of the subject, which will have to be extended and confronted autonomously by the students as personal work. The teaching material that should be used will basically consist of books and review articles.

PAUL/Seminars*. Complementary to the theory classes, PAUL and seminars will address (with use of ICT) specific topics related to poison and contaminant agents. The active participation of all students will be promoted during the resolution/discussion of the issues/situations/problems/cases that may arise. During the preparation of the work, individual or group tutorials, face-to-face or virtual, will be available, with the objective of solving doubts and guide students on their elaboration.

Laboratory practices*. Practical sessions for the observation and execution of procedures, methodologies and techniques that are used in the study of toxic agents. Group work and active self-learning is promoted.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Laboratory work	7.5	0.3	1, 3, 8, 9, 10
Lectures	21	0.84	1, 2, 3, 5, 6, 7, 8
Seminars and problems	12.5	0.5	3, 8
Type: Autonomous			
Individual work	56	2.24	1, 3, 5, 6, 7, 8
Preparation, elaboration and evaluation of a work with scientific format	25	1	1, 2, 7, 8, 4, 11
Resolution of cases and problems	1.6	0.06	1, 2, 8, 4

Assessment

Evaluation *

The competences of this subject will be evaluated by:

- a) A first mid-term partial exam, where the theory program and the seminars carried out to date will be evaluated. Worth 25% of the final grade.
- b) A second exam (2nd partial exam) at the end of the course, where all the content of theory, seminars and laboratory practices will be evaluated. Worth 50% of the final grade.
- c) Preparation of a scientific poster that will be prepared in groups throughout the semester on a topic of toxicology. Worth 15% of the final grade
- d) Case resolution and classroom activities. Worth 10% of the final grade

To pass the subject, the weighted average grade of the two exams and the overall grade of the subject (calculated from the weighted average for all activities) must be equal to or greater than 5.0. Therefore, the subject will be considered 'failed' when:

- The weighted average grade of the two exams does not reach a minimum of 5.0. In this case, the final grade will be listed as 'failed' regardless of the grade for the other activities
- The weighted average grade of the two exams is equal to or greater than 5.0 but the overall average of the subject is less than 5.0

When the student does not carry out any of the activities of evaluation these will score 0. The no attendance by unjustified reasons to a laboratory practice or seminar will subtract 0,25 points to the final grade. A student will be considered non-assessable when his/her participation in assessment activities represents $\leq 15\%$ of the final grade. In order to take the reevaluation exam, the student must have previously been assessed in a set of activities that represent a minimum of two thirds of the final grade of the subject. The mark of the reevaluation exam will replace the weighted average mark of the midterm exams.

This course does not use the one-time evaluation system.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Cases and class activities	10	0	0	1, 2, 7, 8, 4
First partial test	25	0.6	0.02	1, 2, 3, 5, 7, 8
Scientific poster	15	0	0	1, 2, 3, 6, 7, 8, 11
Second partial test	50	0.8	0.03	1, 2, 3, 5, 6, 7, 8, 9, 10

Bibliography

AMIARD-TRIQUET C, AMIARD JC, RAINBOW PS (eds.). Ecological Biomarkers: Indicators of Ecotoxicological Effects. CRC Press, 2016.
[https://catalegclassic-uab-cat.are.uab.cat/record=b1982195~S1*cat]

- ANDERSON D, CONNING DM (eds.). *Experimental Toxicology: The Basic Issues*. Royal Society of Chemistry, 1993. [https://catalegclassic-uab-cat.aren.uab.cat/record=b1765890~S1*cat]
- BARCELOUX DG (ed.). *Medical Toxicology of Natural Substances*. Wiley, 2008. [https://catalegclassic-uab-cat.aren.uab.cat/record=b1956412~S1*cat]
- CAMPBELL A, CHAPMAN M. *Handbook of Poisonings in Dogs and Cats*. Blackwell Science, 2000. [https://catalegclassic-uab-cat.aren.uab.cat/record=b1803442~S1*cat]
- DART RC. *The 5 Minute Toxicology Consult*. Lippincott, Williams and Wilkins, 1999. [https://catalegclassic-uab-cat.aren.uab.cat/record=b2095560~S1*cat]
- GUIART R. *Tòxics, Verins, Drogues i Contaminants, Volumes I-II-III*. Servei Publicacions UAB, 2008-2009.
- GUPTA PK. *Concepts and Applications in Veterinary Toxicology: An Interactive Guide*. Springer, 2019.
- *GUPTA R (ed.). *Veterinary Toxicology: Basic and Clinical Principles*. Academic Press, 2018. [https://catalegclassic-uab-cat.aren.uab.cat/record=b1728237~S1*cat ; <https://www.sciencedirect-com.aren.uab.cat/book/9780128114100/veterinary-toxicology?via=ihub=>]
- *HOVDA L, BRUTLAG A, POPPENG R, PETERSON K (eds.). *Small Animal Toxicology*. Wiley-Blackwell, 2016. [https://catalegclassic-uab-cat.aren.uab.cat/record=b2095561~S1*cat]
- KLAASSEN CD (ed.). *Casarett & Doull's Toxicology: The Basic Science of Poisons*. McGraw-Hill, 2018.
- KRIEGER R (ed.). *Hayes' Handbook of Pesticide Toxicology*. Elsevier Science & Technology, 2010. [<https://ebookcentral-proquest-com.aren.uab.cat/lib/uab/detail.action?docID=625355>]
- MARQUARDT H (ed.). *Toxicology*. Academic Press, 1999. [https://catalegclassic-uab-cat.aren.uab.cat/record=b1728215~S1*cat]
- *PETERSON ME, TALCOTT PA. *Small Animal Toxicology*. Elsevier-Saunders, 2013. [https://catalegclassic-uab-cat.aren.uab.cat/record=b1889652~S1*cat]
- *PLUMLEE KH. *Clinical Veterinary Toxicology*. Mosby, 2004. [https://catalegclassic-uab-cat.aren.uab.cat/record=b1795897~S1*cat]
- RATHORE HS, NOLLET LML (eds.). *Pesticides: Evaluation of Environmental Pollution*. CRC Press, 2012. [https://catalegclassic-uab-cat.aren.uab.cat/record=b2092316~S1*cat]
- REPETTO M, REPETTO G. *Toxicología Fundamental*. Díaz de Santos, 2009. [https://catalegclassic-uab-cat.aren.uab.cat/record=b2094439~S1*cat]
- *TILLEY LP, SMITH FWK (eds.). *Blackwell's Five-Minute Veterinary Consult: Canine and Feline*. Wiley-Blackwell, 2015.
- TIMBRELL J. *Principles of Biochemical Toxicology*. CRC Press, 2008. [https://catalegclassic-uab-cat.aren.uab.cat/record=b2092203~S1*cat]
- WALKER CH, HOPKIN SP, SIBLY RM, PEAKALL DB. *Principles of Ecotoxicology*. CRC Press, 2005.
- WORLD HEALTH ORGANIZATION. Diversos volums de la sèrie "Environmental Health Criteria", WHO. [<https://apps.who.int/iris/handle/10665/26724/browse?type=title> ; https://catalegclassic-uab-cat.aren.uab.cat/record=b1872000~S1*cat]

Software

None.

