

28424 - Toxicology

Syllabus Information

Academic Year: 2022/23

Subject: 28424 - Toxicology

Faculty / School: 105 - Facultad de Veterinaria

Degree: 451 - Degree in Veterinary Science

ECTS: 6.0

Year: 3

Semester: First semester

Subject Type: Compulsory

Module:

1. General information

1.1. Aims of the course

The general aim of the Toxicology course within the Veterinary Degree is to introduce the student to the knowledge, assessment and treatment of adverse phenomena produced by chemical substances and some physical agents on living beings and, if necessary, apply veterinary knowledge to the resolution of legal and regulatory problems.

Those aims are aligned with the following Sustainable Development Goals as part of the 2030 Agenda for Sustainable Development (<https://www.un.org/sustainabledevelopment/>)

Goal 3: Good Health and Well-Being

Goal 6: Clean Water and Sanitation

Goal 13: Climate Action

Goal 14: Life Below Water

Goal 15: Life on Land

The subject has been divided into blocks which are detailed in the program below. These blocks are as follows:

1. **General Toxicology:** The main types of toxics, their toxicokinetics in the organism, the main mechanisms of toxic action, calculation problems in Toxicology, main methods of analysis, and the general treatment of emergency intoxications are studied.
2. **Environmental and Industrial Toxicology:** The main toxic groups of industrial origin of incidence in Veterinary are studied, such as corrosive substances, alcohols, glycols, and persistent pollutants.
3. **Toxicology of pesticides:** We will treat the pesticides or pesticides of greater incidence in Veterinary, since they are the causative agents of the most frequent poisonings.
4. **Food Toxicology:** This part corresponds to food-borne intoxications affecting animals, with special attention to mycotoxins.
5. **Plant Toxicology:** Due to the enormous number of toxic plant species, in this section we limit ourselves to the study of those that today produce the greatest number of poisonings, although a brief review is made of the plants of greatest historical importance.
6. **Drugs:** In recent years there has been a considerable increase in the number of incidences in small animals that, sometimes due to the negligence of their owners, have access to drugs and psychoactive substances
7. **Toxicology of metals:** Heavy metals and metalloids with significant incidence in Veterinary are studied.
8. **Toxinology:** We will study the most important poisonous animal species in Europe and the clinical pictures they produce and their treatments.

1.2. Context and importance of this course in the degree

Toxicology is a constantly evolving discipline that today encompasses, among others, the study, diagnosis and treatment of the effects of xenobiotics on living beings, the molecular and cellular study of the mechanisms of and the study of the effects of toxic substances on wild flora and fauna. It also participates in the identification and quantification of risks resulting from occupational exposure, and public health aspects with respect to the presence of toxic agents in air, water and the environment in general, as well as in food and medicines.

For all these reasons, Veterinary Toxicology is a fundamental subject in the training of future veterinary professionals, having relevance in all branches of the profession. Its situation within the degree allows students to have already acquired basic previous knowledge, such as the biochemical processes that occur in the cells and the physiological processes in the different animal species, that will favor an adequate understanding of the contents. On the other hand, the knowledge imparted simultaneously in the other subjects of the same four-month period will contribute to a better integration of the subjects treated in the Toxicology subject. Due to the fact that in the third year of the Veterinary degree the student lacks most of the clinical knowledge necessary for an integral understanding of the different clinical pictures produced by intoxications, the teaching staff takes special care so that the student acquires the fundamental clinical and therapeutic knowledge, which can be assimilated with greater extension in the following courses.

1.3. Recommendations to take this course

It is essential to have basic knowledge of Chemistry, Biochemistry and Physiology, taught in the corresponding previous subjects.

2. Learning goals

2.1. Competences

On successful completion of this course, students will be able to:

- Identify and study natural and synthetic toxics
- Apply theoretical knowledge to the resolution of problems of a toxicological nature that may arise during their professional activity.
- Recognize and diagnose different types of symptoms and injuries and associate them with different toxic agents
- Implement the necessary actions to prevent intoxication in animals
- Recognize chemical substances that contaminate and adulterate food, having an impact on Public Health.
- Recognize physical agents that may cause adverse effects to Public and Animal Health.
- Carry out oral and written communication correctly.
- Work as a group and distribute tasks equitably and efficiently
- Know the Fundamentals of Environmental Toxicology

2.2. Learning goals

If students complete the course successfully, they should be able to:

1. Know the etiology of the poisonings that most frequently affect domestic animals and their predisposing factors.
2. Know the mechanisms of exposure, incorporation, transformation and excretion of toxic substances.
3. Understand the mechanisms of action, symptoms and injuries of the toxic substances of interest in Veterinary Medicine.
4. Know the diagnostic procedure and treatment of poisonings, as well as the measures to implement to prevent them.
5. Comprehend the practical activities proposed.
6. Integrate the concepts of the subject in the resolution of practical cases.
7. Write and present properly a written work that relates the different aspects dealt with in the subject.

2.3. Importance of learning goals

The learning results obtained in the subject of Toxicology will favor students directly in the performance of their profession, either in the clinic, in industry or in the Public Administration, through training for the resolution of clinical cases and for the analysis and maintenance of optimal conditions of human and animal health. In all these tasks, Toxicology is a fundamental part, not only in the prevention and treatment of acute or emergency poisonings, but also in chronic ones, avoiding the appearance of degenerative phenomena thanks to the establishment of innocuous exposure values to potential toxics.

3. Assessment (1st and 2nd call)

3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

Learning outcomes 1 to 4 will be assessed by means of a global test structured as follows:

Global written assessment of the lectures and practical sessions (learning outcomes from 1 to 5). This test will consist of conceptual multiple choice questions (60-90%) and open-ended short answer questions (10-40%). It will account for 90% of the student's final grade in the subject.

Learning outcomes 6 and 7 will be assessed by means of a written work (portfolio), which will be carried out throughout the course, and which will contain extended reports of the practical activities. The work will be 10% of the final grade.

The final structure of the written examination of theoretical and practical teaching will be communicated to students well in advance.

The evaluation tests will only be those officially announced.

In order to pass the course, it will be necessary to obtain between the global test and the written work, 50% of the maximum grade, after applying the percentages indicated.

Valuation criteria and requirement levels

The evaluation will be 100 % objective, according to the grades obtained between the written tests corresponding to the theoretical and practical teaching. In general, True-False questions add or subtract points whether the answer is right or wrong, respectively, and in the same amount. Short-answer questions and problems do not deduct points from the total.

Marking system:

According to the national regulation Law 1025/2003, 5th of September which lays down the European system of credits and marking system for the university degree.

0-4,9: FAIL.

5,0-6,9: PASS

7,0-8,9: GOOD (NT).

9,0-10: EXCELLENT (SB).

As the article 158 of the Statutes of the University of Zaragoza lays down, provisional grades will be displayed at least for 7 days and students will be able to review them on the date, time and place provided for that purpose.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The methodology followed in this course is oriented towards achievement of the learning objectives.

A wide range of teaching and learning tasks are implemented, such as lectures, practice sessions, assignments, and autonomous work

1 - Participatory Lectures

2 - Practical sessions

Students will carry out experiments at Toxicology lab. A detailed protocol and all necessary reagents as well as the biosecurity measures to be followed, will be provided to students.

3- Case studies in Toxicology

Students are expected to participate actively in the class throughout the semester.

Classroom materials will be available via Moodle. These include a repository of the lecture notes used in class, the course syllabus, practical sessions handouts, as well as other course-specific learning materials, including a discussion forum. Further information regarding the course will be provided on the first day of class

4.2. Learning tasks

The course includes 6 ECTS organized according to:

Lectures (3.3 ECTS): 33 hours

Practical sessions (2.7 ECTS)

Laboratory sessions (1.8 ECTS): 18 hours

Problem-solving case studies (0.9 ECTS): 9 hours

4.3. Syllabus

Lectures

I. General Toxicology

1. Introduction
2. Experimental Toxicology *
3. Toxicokinetics
4. Biotransformation
5. Toxicodynamics

6. Mutagenesis- Carcinogenesis -Teratogenesis
7. Endocrine disruption
8. Analytical Toxicology
9. Risk assessment
10. Treatment of poisoning

II. Environmental and Industrial Toxicants

1. Persistent contaminants
2. Corrosive substances
3. Alcohols and glycols
4. Petroleum

III. Pesticides

1. Insecticides
2. Acaricides
3. Rodenticides
4. Molluscicides
5. Herbicides and fungicides

IV. Feed and water Contaminants:

1. Urea-Salt and Water deficiency
2. Teobromine
3. Mycotoxins

V. Poisonous Plants:

1. Hepatotoxic plants
2. Lectines
3. Cyanogenic and Nitrate and nitrite accumulating plants
4. Oxalates-containing plants

VI. Drugs of Use and Abuse:

1. CNS depressants
2. Stimulants

VII. Metals:

1. Copper- Molybdenum
2. Lead
3. Mercury
4. Arsenic
5. Cadmium

Practical sessions Place: Toxicology Lab

Session 1: *In vitro* Toxicity, cell culture. Alternative methods in Toxicology* 4h.

Session 2: Poisonous and Venomous animals identification. 4h

Session 3: Neurotoxicants: AChE inhibitors. 4h.

Session 4: Methemoglobinemia. Nitrite measurement. 3h.

Session 5: Poisonous Plants Identification. 3h.

Case Studies

Session 1: Calculations in Toxicology problems. 3h

Session 2: Toxicological databases. 3h

Session 3: Case studies in Toxicology. 3h

* Principles of the 3Rs Replacement. Use of alternative methods which avoid or replace the use of animals.

4.4. Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course will be provided on the first day of class or please refer to the following website (<https://veterinaria.unizar.es/>)

4.5. Bibliography and recommended resources

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=28424>