Academic subject: Drug Legislation, Pharmacovigilance and Toxicology

Degree Class: L-38	**Degree Course:** Animal Sciences	**Academic Year:** 2020/2021	
	Kind of class: mandatory	**Year:** II	**Period:** II semester
		ECTS: 6 divided into **ECTS lessons: 5** **ECTS exe/lab/tutor: 1**	

Time management, hours, in–class study hours, out–of–class study hours
lesson: 50 exe/lab/tutor: 25 in–class study: 0 out–of–class study: 75

Language: Italian	**Compulsory Attendance:** Yes		
Subject Teacher (1): Claudia Zizzadoro	**Tel:** 0804679921 **e–mail:** claudia.zizzadoro@uniba.it	**Office:** Department of Veterinary Medicine Room (1): 28I Room (2): 26 Floor: 1st (building II)	**Office days and hours (1):** Wednesday_15:00-17:00 Thursday_11:30-13:30
Subject Teacher (2): Olimpia Lai	**Tel:** 0804679924 **e–mail:** olimpia.lai@uniba.it		**Office days and hours (2):** Tuesday_12:00-14:00 Wednesday_16:00-18:00

Prerequisites:
Principles of physiology and endocrinology of domestic animals
Students should possess knowledge and competence regarding the anatomy, histology, cytology, physiology, immunology, pathology and pathophysiology of higher animals. Furthermore, knowledge and competence regarding structural and functional characteristics of the most common pathogens of higher animals (bacteria and parasites) are required, along with knowledge and competence in chemistry and biochemistry. Finally, knowledge and competence regarding farming practices and sanitary management of food-producing and non-food-producing animals would be opportune.

Educational objectives:
The teaching aims to explain the health, ecological and ethical problems that arise from use, misuse, abuse and non-use of drugs in the professional contexts for which the students are being trained. The ultimate purpose is to make the students understand the origin of the current legislation on drugs for food-producing and non-food-producing animals, the role that the rules dictated by existing law play in the management of the risk for drug-related problems, and hence the importance of respecting such rules.
The teaching also aims to make the students understand the hazards arising from potential exposure of food-producing and non-food-producing animals to toxic substances of natural and anthropogenic origin, as well as the importance of adopting strategies to avoid or reduce such exposure in order to protect health and welfare of the various animal species, animal wildlife, and health of the consumer of foodstuffs of animal origin.

Expected learning outcomes (according to Dublin Descriptors)

Knowledge and understanding:
The teaching provides students with knowledge and understanding of the following topics:
- basic principles of the interaction between drugs and living organisms that are treated with such drugs (food-producing and non-food-producing animals) or that are exposed to such drugs (workers and consumers of foodstuffs of animal origin, as well as micro- and macro-organisms with pathogenic, ecological or technological roles);
- factors that influence the quali-quantitative aspects of drug-organism interaction and its effects;
- main national and european laws that regulate the use of drugs in food-producing and non-food-producing animals, as well as in animal feed production;
- specific drug-related responsibilities assigned by legislation to professional figures that are formed by this Bachelor degree course;
- origin and toxic potential of the various natural and anthropogenic xenobiotics;
- basic principles of toxicodynamics, toxicokinetics, antidote therapy and decontamination;
- principles that regulate the movement of pollutants along the trophic chain.

Applying knowledge and understanding:
The knowledge and understanding acquired by students by means of this teaching will turn into:
- conscious, responsible and virtuous approach to the activities linked to the professional

practice that include drugs as potential chemical hazards (e.g. implementation of some of the pharmacological treatments prescribed by veterinarians and monitoring of the animal response to treatment; production of animal feed containing drugs or pharmacologically active additives; trade of foodstuffs obtained from pharmacologically treated animals; storage and manipulation of the medications that are to be administered to animals or added to feed; disposal of unused or expired medications);

- conscious, responsible and vituous approach to situations linked to the professional practice that imply or may imply exposure of food-producing and non-food-producing animals to natural and/or anthropogenic toxic xenobiotics, or contamination of the trophic chain.

Making judgements:

The knowledge and understanding acquired by students by means of this teaching will enable them to make the following judgements:

- differentiation between desirable and indesirable effects of drugs occurring in the treated animals, in the workers that manipulate medicines, in the environment, and differentiation between the undesirable effects that must be notified and those for which notification is not required;
- prediction of the behaviour of a drug after administration or exposure, as well as prediction of how the intervention of certain factors may change drug behaviour and the biological response arising from it;
- prediction and recognition of the situations where the risk of animal exposure to toxic xenobiotics of natural or anthropogenic origin may be present;
- choice and adoption of the most appropriate remedial actions in case of animal exposure to toxic xenobiotics (to the extent of what the professional figures formed by this Bachelor degree course are allowed to do).

Communication:

By this teaching, students will learn a technical vocabulary that will be useful in their professional activity after graduation in order to:

- communicate with veterinarians (e.g.: understand their instructions regarding drug administration, report effects observed in the treated or intoxicated animals to them);
- communicate with inspectors during pharmacosurveillance inspections;
- understand the information reported in drug labels and translate it in appropriate drug handling.

Moreover, by means of this teaching, students will learn how to fill in the documentation (either or digital) that assures the traceability of drugs used in animals and in the production of animal feed.

Lifelong learning skills:

This teaching provides a background knowledge that will enable the future professional figures formed by this Bachelor degree course to keep up with the continuous changes occurring in veterinary drug market and legislation, as well as in the fate and movement of and in the exposure to toxicants of natural and anthropogenic origin

Course program

Drug legislation and Pharmacovigilance

- Introduction to the subject. Definition of drug. Difference between "classic drugs" and "chemotherapeutic agents". Applications of drugs in the professional contexts addressed by this Course of Study and resulting problems.
- Fundamentals of General and Clinical Pharmacology
  - ☐ Primary pharmacodynamics of "classic drugs": mechanisms responsible for the primary (desired) effects; quali-quantitative aspects of drug receptor action and causes of variability. Primary pharmacodynamics of "chemotherapeutic agents": selective toxicity; mechanisms responsible for the drug anti-pathogen effect; quali-quantitative aspects of drug anti-pathogen action.
  - ☐ Secondary pharmacodynamics of "classic drugs" and "chemotherapeutic agents": mechanisms responsible for the secondary (side and toxic) effects; quali-quantitative aspects of the non-required drug actions and causes of variability. Other possible undesirable consequences of drugs for the animals subjected to pharmacological treatment: hypersensitivity and idiosyncratic reactions, dismicrobism and biotropic phenomena.
  - ☐ Drug administration: major routes of drug administration; drug formulations and pharmaceutical kinetics.
  - ☐ Pharmacokinetics: basic principles of drug movement relative to the animal body; drug absorption, distribution,

metabolism and excretion (quali-quantitative aspects and causes of variability).
- Drug administration protocol and its relationship with efficacy, tolerability and toxicity of locally and systemically acting drugs. Therapeutic window. Patient information leaflet. Variability of the clinical response to drugs. Indexes of drug safety (therapeutic index and drug's safety margin).
- Dangerousness of exposure to drugs used in food-producing and non-food-producing animals for human and environmental health: professional risks, drug residue toxicity and withdrawal time, environmental impact, selection of acquired drug resistance, technological dismicrobism

- Main national and european laws that regulate the use of pharmacologically active substances in food-producing and non-food-producing animals, as well as in animal feed production

Toxicology

- General part
  - Definition of toxic substance.
  - Dose-response relationship: determination of toxicity and dose-response curves.
  - Toxicity tests.
  - General toxicity: short-, medium- and long-term toxicity.
  - Special toxicity: teratogenesis, mutagenesis, carcinogenesis.
  - Toxic dose: minimum toxic dose, maximim toxic dose, lethal dose 50.
  - Fate of xenobiotic compounds in living organisms: routes of exposure, toxicokinetics, metabolism.
  - Bioaccumulation and Biomagnification.
  - Factors influencing toxicity.
- Special part
  - Pesticides: herbicides, insecticides, rodenticides.
  - Heavy metals: mercury, lead, cadmium, fluorine.
  - Persistent organic pollutants (POPs): dioxins, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs).
  - Mycotoxins.
  - Algal biotoxins.
  - Toxic plants.
  - Radionuclides.
- Residue Toxicity
  - Definition of residue.
  - Classification of residues.
  - Factors influencing residue formation in food-producing animals.
  - Toxicological risk assessment of residues.
  - Bioavailability and relay toxicity of residues.
  - Main national and european laws dealing with residues.
  - Concept of Residue Acceptability and Definition of Maximum Residue Level (MRL).
  - Concept of Residue Tolerance in relation to environmental contaminants.
  - Newly formed residues.

Teaching methods:

Lectures are taken in a classroom and supported by a power point presentation and, where applicable, live demonstration. In order to facilitate student learning and make it as meaningful as possible, the topics of each lecture are problematized and contextualized with situations from real everyday life. Possible curiosities and/or questions of students are taken as the starting point for further in-depth discussion of a topic.
For the "Toxicology" part of the teaching program, students are - on a regular basis - placed in groups of 2 to 3 each and asked to write an essay about a topic chosen by the teacher and to present their work to the class by means of a power-point presentation.
Traditional lessons are accompanied by practical lessons that take place, depending on the specific activity to be carried out, in a classroom (e.g.: watching a documentary film followed by group discussion), in a laboratory (e.g.: performing microbiotests for environmental toxicity assessment) or in a dedicated space (e.g. identification of toxic plants in the Toxic Garden).

Auxiliary teaching:

Rubber boots and disposable gloves are required for the practical activity in the Toxic garden. White coat and disposable gloves are required for the practical activities in the lab.

Assessment methods:

For both parts of the teaching (namely, "Drug Legislation and Pharmacovigilance" and "Toxicology"), knowledge and skills acquired by students are verified by oral examination focusing on at least three different topics of the program. Students can take the two orals on the same exam session or on different exam sessions, and the final mark (expressed

out of thirty) is the average of the marks obtained for each oral. Passing the "Drug Legislation and Pharmacovigilance" exam is prerequisite for admission to the "Toxicology" exam.
During the examination procedure, students will be evaluated for their knowledge and understanding of the principles and mechanisms that regulate the interaction of xenobiotics (drugs and toxicants) with living systems, as well as for their ability to apply their knowledge to identify and resolve professional issues. Students will also be evaluated for their ability to understand and use proper pharmaco-toxicological vocabulary when reading or communicating about drugs and toxicants. The essays prepared by the students for the "Toxicology" part of the program during the classes will be taken into consideration in the final mark.

Bibliography:

- Bill R.L. “Clinical Pharmacology and Therapeutics for Veterinary Technicians”. Mosby (Elsevier), 4th Edition (2016)
- Carli S., Ormas P., Re G., Soldani G. “Farmacologia veterinaria”. Ed. Idelson-Gnocchi (2009)
- Bettiol F., Fabbriconi A., Lussignoli P., Neri G., Siciliano P. "Manuale delle preparazioni veterinarie". Ed. Tecniche Nuove (2019)
- Gupta R.C. “Veterinary Toxicology, Second Edition: Basic and Clinical Principles". Academic Press, 2nd Edition (2012)
- Plumlee “Clinical veterinary toxicology”. Mosby Inc. Ed. (2004)
- Mengozzi & Soldani “Tossicologia veterinaria”. Ed. Idelson-Gnocchi (2010)
- Material provided by the teacher consisting of the PDF version of the power point presentations shown during the lessons (made accessible online via Google Drive immediately after the end of the teaching period)