Academic subject: Residue toxicology				
Degree Class: L-38		**Degree Course:** Animal Science	**Academic Year:** 2020/2021	
		Kind of class: optional	**Year:** III	**Period:** II semester
			ECTS: 2 divided into **ECTS lessons:** 1 **ECTS exe/lab/tutor:** 1	

Time management, hours, in–class study hours, out–of–class study hours
<div align="center">lesson: 10   exe/lab/tutor: 25   in–class study: 0   out–of–class study: 15</div>

Language: Italian	**Compulsory Attendance:** Yes		
Subject Teacher (1): Olimpia Lai	**Tel:** 0804679924 **e–mail:** olimpia.lai@uniba.it	**Office:** Department of Veterinary Medicine Room (2): 26 Floor: 1st (building II)	**Office days and hours (1):** Tuesday 12:00 am - 02:00 pm Wednesday 04:00pm-06:00pm

Prerequisites:
Hygiene and securety of primary productions of animal origin
Drug Legislation, Pharmacovigilance and Toxicology
Students should possess knowledge and competence regarding the anatomy, histology, cytology of higher animals, as well as knowledge and competence relating to the physiology, immunology, pathology and pathophysiology of these animals, from a molecular, cellular, organs and systems point of view. 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 skills related to the most common techniques of breeding and sanitary management of DPA and NDPA animals would be appropriate.

Educational objectives:
The teaching aims to explain the hazards associated with the exposure of DPA and NDPA animals to various xenobiotic substances, of natural and anthropic origin (including drugs), present in the environment or occurring along the productive chain. food production, which can be found in feed intended for DPA species, in animal products intended for humans, in food intended for NDPA pets, to protect the health and well-being of the various species and the consumer of the food of origin animal. The teaching also aims to provide the student with a full and mature understanding of the importance of a rigorous knowledge of obligations, restrictions, prohibitions and operational/ organizational models prescribed by the current legislation governing the presence of xenobiotic residues in DPA and NDPA animals.

Expected learning outcomes (according to Dublin Descriptors)	**Knowledge and understanding:** The teaching provides students with knowledge and understanding of the following topics: - principles that regulate the interaction of xenobiotics with living organisms that are exposed to these substances (animal DPA and NDPA, human operator, human consumer of food of animal origin, pathogenic, environmental and technological micro-macroorganisms); - factors that contribute to determining and influencing the type and intensity of the effects resulting from the xenobiotic-organism interaction; - main national and community legislative references governing the presence of residues of xenobiotic substances in food intended for or produced by animals DPA NDPA; - processes of interaction and origin of the various xenobiotic substances; - principles that regulate the movement of pollutants along the trophic chains; **Applying knowledge and understanding:** The knowledge and understanding acquired by students by mean of this teaching will turn into: - conscious, responsible and virtuous approach to the activities linked to production and industrial practices that imply or could imply the presence of xenobiotic residues in

food intended for or produced by animals DPA and NDPA, whether of natural and/or anthropic origin, concomitant with contamination of the trophic or productive chains of the target species.

Making judgements:
The knowledge and understanding acquired by students by mean of this teaching will enable them to make the following judgements:
- prediction of the behaviour of a xenobiotic after exposure of target species, as well as prediction of how the intervention of certain factors may change its 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's 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 rescue centres veterinarians (e.g.: reporting effects observed in intoxicated or otherwise critical aquatic wildlife casualties);
- communicate with the Public Veterinary Service of Animal Health in case of reporting distressed or dead subjects of target species;
Moreover, by means of this teaching, students will learn how to fill in the documentation (either paper or digital) required by authorities in case of reporting, rescuing or death of target protected species.

Lifelong learning skills:
This teaching provides a background knowledge that will enable the future professional figures formed by this bachelor's degree course to keep up with the continuous changes occurring in environmental new pollutants and legislation, as well as in the fate and movement of and in the exposure to xenobiotics of natural and anthropogenic origin.
This teaching provides a background knowledge that will enable the future professional figures
- 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;
- 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;
- to foresee and recognize the risk situations of contamination of food or productive chains with xenobiotic substances of natural or anthropic origin;
- to provide for the collection of samples to be examined during quality checks to determine any compliance with current regulations on the presence of xenobiotic residues in food intended for or produced by DPA and NDPA species;
- to be able to provide for the collection of samples to be examined during dangerous situations or mortality of farmed species (in consultation with the official veterinary staff).

Course program	

Course program
Definition of food toxicology
Classification of residues:
    Contaminants
    Toxic of natural origin
    Technological toxic
Risk assessment and management:
    Dose-response relationship
    Safety margins
Principles of toxicokinetics:
    transmembrane transport models

influences of and on the intestinal microbiome

lymphatic transport

barriers

metabolisms (bioinactivation, bioactivation)

storage locations (bioaccumulation, biomagnification)

effects of kidney maturity on the excretion of xenobiotics

Good zootechnical practices for the management of residues of pesticides and veterinary drugs in food of animal origin

Factors influencing the formation of residues in food intended for pet species

Factors influencing the formation of residues in food intended for production animal species

Factors that influence the formation of residues in animal species from the production of foodstuffs intended for humans

Climate change and food safety:

Mycotoxins

Algal biotoxins

Endocrine disrupters:

Estrogenic compounds in foods of animal origin

Newly formed residues:

technological xenobiotics (food preparation, additives):

polycyclic aromatic hydrocarbons

aromatic amines

nitrosamines

acrylamide or packaging:

cyto and genotoxicity test

Residues of carcinogenic xenobiotics:

Genetic predisposition to carcinogens in food

Genetic influences on metabolizing enzymes

Carcinogens in food:

mycotoxins,

heterocyclic amines,

polycyclic aromatic hydrocarbons,

nitrosamines

Evaluation of the safety of residues in food:

Risk assessment from contaminants:

regulations

sampling methods

sample preparation and analysis

interpretation of the results of the surveillance programs

Evaluation of the risk from veterinary drugs:

types of toxicity studies

elaboration of MRLs and suspension times

evaluation of particular molecules (griseofulvin, beta-lactamines, macrolides, aminoglycosides, fluoroquinolones, sulfonamides, chloramphenicol, avermectins, tranquilizers, coccidiostats, growth promoters

Methods of detection, determination and rapid tests for:

Pesticides: anticholinergic insecticides, neonicotinoids, fungicides, herbicides

Environmental contaminants:

polycyclic aromatic hydrocarbons, dioxins and PCBs, heavy metals and platinum-like, mycotoxins

Veterinary drugs

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.

On a regular basis, students will be asked to organize themselves in groups of 2 to 3 each and asked to write an essay on a topic indicated by the teacher, which they will then discuss in the classroom with their own 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.: documentary films followed by group discussion), in a laboratory (e.g.: performing simple screening tests for residues detection); they also require each student to be actively involved in the execution

and / or discussion of the topics covered by the exercise.

Auxiliary teaching:
White coat, disposable gloves and masks are required for the practical activities in the lab.

Assessment methods:
Knowledge and skills acquired by students are verified by oral examination focusing on at least three different topics of the program.
During the examination procedure, students will be evaluated for their knowledge and understanding of the principles and mechanisms that regulate the interaction of xenobiotics 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 technical vocabulary when reading or communicating. The essays prepared by the students during the classes will be taken into consideration in the final mark.

Bibliography:
- Watson D.H. "Pesticide, veterinary and other residues in food". Woodhead Publishing Limited and CRC Press LLC (2004)
- Shibamoto T., Bjeldanes L. "Introduction to Food Toxicology", 2nd Edition. Academic Press-Elsevier (2009)
- Mengozzi & Soldani "Tossicologia veterinaria". Idelson-Gnocchi Ed. (2010).
- Gupta R.C. "Veterinary Toxicology, Second Edition: Basic and Clinical Principles". Academic Press-Elsevier, 2nd Edition (2012)
- Nikinmaa M. "An introduction to aquatic toxicology". Academic Press-Elsevier (2014)
- Gupta R.C. "Biomarkers in toxicology". Academic Press-Elsevier (2014)
- Jinap Selamat J., Iqbal S.Z. "Food Safety. Basic Concepts, Recent Issues, and Future Challenges" Springer International Publishing Switzerland (2016)
- 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).