

**ACADEMIC YEAR 2023/2024**

<b>General information</b>	
Academic subject	<b>RESIDUE TOXICOLOGY</b> integrated exam of HYGIENE AND SAFETY OF PRIMARY PRODUCTION
Degree course	Animal Science L38
Academic Year	III year
European Credit Transfer and Accumulation System (ECTS)	2
Language	Italian
Academic calendar (starting and ending date)	II semester: 26/02/2024 – 14/06/2024
Attendance	Mandatory

<b>Professor/ Lecturer</b>	
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Virtual headquarters	Microsoft Teams plataform if necessary (Code: mj6qar3)
Tutoring (time and day)	Tuesday and Wednesday: 13.00 – 15.00 by appointment via email

<b>Syllabus</b>	
<b>Learning Objectives</b>	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.
<b>Course prerequisites</b>	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
<b>Contents</b>	Definition of food toxicology Classification of residues: Contaminants Toxic of natural origin Technological toxic Risk assessment and management: Dose-response relationship

	<p>Safety margins</p> <p>Principles of toxicokinetics:</p> <ul style="list-style-type: none"> <li>transmembrane transport models</li> <li>influences of and on the intestinal microbiome</li> <li>lymphatic transport</li> <li>barriers</li> <li>metabolisms (bioinactivation, bioactivation)</li> <li>storage locations (bioaccumulation, biomagnification)</li> <li>effects of kidney maturity on the excretion of xenobiotics</li> </ul> <p>Good zotechnical practices for the management of residues of pesticides and veterinary drugs in food intended for pet species and for food production animal species</p> <p>Climate change and food safety:</p> <p>Endocrine disrupters:</p> <ul style="list-style-type: none"> <li>Estrogenic compounds in foods of animal origin</li> </ul> <p>Newly formed residues:</p> <ul style="list-style-type: none"> <li>technological xenobiotics (food preparation, additives):</li> <li>contaminants from packaging:</li> </ul> <p>Residues of carcinogenic xenobiotics:</p> <ul style="list-style-type: none"> <li>Genetic predisposition to carcinogens in food</li> <li>Genetic influences on metabolizing enzymes</li> </ul> <p>Carcinogens in food:</p> <p>Evaluation of the safety of residues in food:</p> <p>Risk assessment from contaminants:</p> <ul style="list-style-type: none"> <li>regulations</li> <li>sampling methods</li> <li>sample preparation and analysis</li> </ul> <p>Evaluation of the risk from veterinary drugs:</p> <ul style="list-style-type: none"> <li>types of toxicity studies</li> <li>elaboration of MRLs and suspension times</li> </ul> <p>Methods of detection, determination and rapid tests for pesticides, environmental contaminants, and veterinary drugs</p>
<b>Books and bibliography</b>	<ul style="list-style-type: none"> <li>• Watson D.H. "Pesticide, veterinary and other residues in food". Woodhead Publishing Limited and CRC Press LLC (2004)</li> <li>• Gupta R.C. "Veterinary Toxicology, Second Edition: Basic and Clinical Principles". Academic Press-Elsevier, 2nd Edition (2012)</li> <li>• Shibamoto T., Bjeldanes L. "Introduction to Food Toxicology", 2nd Edition. Academic Press-Elsevier (2009)</li> <li>• Gupta R.C. "Biomarkers in toxicology". Academic Press-Elsevier (2014)</li> <li>• Jinap Selamat J., Iqbal S.Z. "Food Safety. Basic Concepts, Recent Issues, and Future Challenges" Springer International Publishing Switzerland (2016)</li> </ul>
<b>Additional materials</b>	<ul style="list-style-type: none"> <li>• 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).</li> </ul>

<b>Work schedule</b>			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
<b>50</b>	<b>8</b>	<b>10</b>	<b>32</b>

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<b>Teaching strategy</b>	<p>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.</p> <p>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.</p> <p>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.</p>	
<b>Expected learning outcomes</b>		
<b>Knowledge and understanding on:</b>	<p>The teaching provides students with knowledge and understanding of the following topics:</p> <ul style="list-style-type: none"> <li>• 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);</li> <li>• factors that contribute to determining and influencing the type and intensity of the effects resulting from the xenobiotic-organism interaction.</li> <li>• main national and community legislative references governing the presence of residues of xenobiotic substances in food intended for or produced by animals DPA NDPA;</li> <li>• processes of interaction and origin of the various xenobiotic substances;</li> </ul> <p>principles that regulate the movement of pollutants along the trophic chains</p>	
<b>Applying knowledge and understanding on:</b>	<p>The knowledge and understanding acquired by students by mean of this teaching will turn into:</p> <ul style="list-style-type: none"> <li>• 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.</li> </ul>	
<b>Soft skills</b>	<ul style="list-style-type: none"> <li>• <i>Making informed judgments and choices</i> <ul style="list-style-type: none"> <li>○ understand the main information reported in the leaflet of pharmaceutical products and turn them into correct management and handling of these products when treating the animals (food-producing and non-food-producing animals) or preparing medicated feed;</li> <li>○ fill in and manage the documentation for assuring the traceability of the medicines and medicated feed that are used in animals (both food-producing and non-food-producing animals) and in the production of animal feed (for what falls in the competence of the professional figures formed by this Bachelor degree course);</li> <li>○ predict and recognize the situations in which animal exposure to toxic xenobiotics of natural or anthropogenic origin may occur, identifying the</li> </ul> </li> </ul>	

	<p>most critical activities that are carried out in a geographic area (e.g. presence of factories, garbage dumps, agricultural activities, urban maintenance);</p> <ul style="list-style-type: none"> <li>○ choose and implement 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).</li> </ul> <ul style="list-style-type: none"> <li>• <i>Communicating knowledge and understanding</i> By this teaching, students will learn a technical vocabulary that will be useful in their professional activity after graduation in order to: <ul style="list-style-type: none"> <li>○ communicate with veterinarians (e.g.: understand their instructions regarding drug administration, report effects observed in the treated or intoxicated animals, report the intervention of factors that may modify the response of animals to drugs and/or toxicants);</li> <li>○ communicate with the farmer, the farmworkers and/or the animalkeepers (e.g. explain the meaning of the rules that govern the administration of drugs to animals, as well as the production of medicated feed, and the importance of applying them; acquire information that may help identify possible sources of animal intoxication)</li> <li>○ communicate with inspectors during pharmacosurveillance inspections;</li> <li>○ communicate with local authorities in case of environmental contamination that may put at risk wildlife species (particularly the protected ones);</li> <li>○ communicate with colleagues (i.e. other technicians) in order to share professional experiences involving drugs or toxicants and/or to express personal opinions in a discussion about drugs, toxicants and their management strategies.</li> </ul> </li> <li>• <i>Capacities to continue learning</i> The student must have acquired the ability to improve his knowledge independently through further study, attendance of advanced courses and training periods at companies in the food supply chain</li> </ul>
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Assessment and feedback	
<b>Methods of assessment</b>	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.
<b>Evaluation criteria</b>	<ul style="list-style-type: none"> <li>• <i>Knowledge and understanding (1 to 8 points)</i></li> <li>• to know the concepts and principles underlying the interaction of toxic substances with living organisms.</li> <li>• to know the problems that can derive from the interaction of drugs and toxic substances with DPA species.</li> <li>• to know the origin and the modalities of formation of the various toxic substances and the principles that regulate the movement of pollutants along the trophic chains.</li> <li>• <i>Applying knowledge and understanding (1 to 8 points)</i></li> </ul>

	<ul style="list-style-type: none"> <li>• having understood how it is possible to intervene to reduce the exposure of DPA species to toxic substances of natural or anthropic origin and / or reduce the contamination of food chains, as well as assist the staff in production chains</li> <li>• <i>Communicating knowledge and understanding (1 to 3 points)</i></li> <li>• critical reasoning skills on the study carried out.</li> <li>• ability to autonomously formulate one's own opinion</li> <li>• <i>Communication skills (1 to 3 points)</i></li> <li>• ability to discursively organize one's knowledge.</li> <li>• ability to present one's reasoning effectively and linearly.</li> <li>• ability to use specialist vocabulary competently</li> <li>• be able to discuss about the prevention of infectious diseases in DPA species with other technicians</li> <li>• <i>Capacities to continue learning (1 to 8 points)</i></li> <li>• To improve his knowledge of the topics through advanced courses and training periods in food production facilities</li> </ul>
<p><b>Criteria for assessment and attribution of the final mark</b></p>	<p>Knowledge and skills acquired by students are verified by oral examination focusing on at least three different topics of the program.</p> <p>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, expressed as thirtieths</p>
<p><b>Additional information</b></p>	