Veterinary Pharmacology and Pharmacy (5 CFU; 55 h: 51 h Lessons and 4 h Practical activity)
The course aims to provide students with detailed knowledge of the mechanisms of action, kinetic behaviour and metabolism of drugs employed in Veterinary Medicine, with particular reference to the differences among species. In addition, the risk-benefit ratio of pharmacological treatments and the different drug administration modalities will be examined, as well as the legal provisions regarding veterinary drug use to protect the public health (animals and humans) and the environment.

LESSONS			
Subjects and skills acquired	**Topics**	**Specific contents**	**Hours**
PHARMACOLOGY Description of the subject matter contextualized for the veterinary profession [acquisition of the correct terminology and baseline concepts of "drug" and risk/benefit ratio]	**GENERAL PAHRMACOLOGY**	The various disciplines making up Pharmacology; history outline; definition of a drug, difference between a drug and a toxic agent; origin and nomenclature of drugs. Different types of pharmacological action (useful, useless, harmful, direct, indirect, reflected indirect, humoral indirect, local, general or systemic) Pharmaceutical forms and preparations; prescription compounding. Drug latency time/period and factors determining it.	2
KINETICS (ADME) *Description of the effects on a xenobiotic (drug or toxic agent) by the body [acquisition of a grounding in compartmental models and the clinical significance of the variations in drug blood concentrations during the time]*	***ABSORPTION***	Mechanism of drug transport across biological membranes: filtration, simple diffusion, carrier-mediated transport (facilitated or active. Main features of an absorption site. Main sites of xenobiotic absorption (GI tract, respiratory tract, skin, mammary gland, injection site).	2
		Criteria for choosing the route of administration of a drug. Natural, parenteral, topical pathways. Routes of drug administration.	2
		Solid pharmaceutical preparations (granular and micro-granular, powders, tablet, capsule, bolus), liquid ones (solutions, suspensions, emulsions); soft ones (pastes and ointments).	1

	DISTRIBUTION	Blood and tissue protein binding; general concepts and causal factors. Xenobiotic distribution in body tissues and other districts.	2
		Factors determining the distribution process. Redistribution. Accumulation. Residual characteristics of the drugs.	2
KINETICS (ADME) *Description of the effects on a xenobiotic (drug or toxic agent) by the body [acquisition of a grounding in compartmental models and the clinical significance of the variations in drug blood concentrations during the time]*	***ELIMINATION PROCESS: Metabolism***	Xenobiotic clearance mechanisms (metabolism and excretion). Metabolism of xenobiotics: significant and usefulness. Differences between Phase 1 and Phase 2 reactions. Phase 1 reactions: cytochrome P450-dependent oxidation. The cytochrome P450 cycle in hydroxylation. Cytochrome P450-dependent mixed function oxidases.	2
		Phase 1 reactions: flavinic oxidation; extrachromosomal oxidation. Reduction reactions. Hydrolysis.	1
		Conjugation reactions (Phase 2): mechanisms, features, limiting factors, different typologies, species specificity.	1
		Main factors impacting xenobiotic metabolism: species, breed, sex, age, disease, diet. Enzymatic induction and inhibition: the significance of mechanisms, effects on drug kinetics and potential toxicity. Prodrugs.	2
	ELIMINATION PROCESS: Excretion	Excretion of xenobiotics: renal, bile, respiratory, mammary, and minor pathways; factors altering drug excretion.	2
KINETICS		Pharmacokinetics: kinetic parameters of relevance in professional veterinary practice.	2

(Kinetic parameters) *Description of kinetic processes (ADME) by means of parameters [acquisition of the mathematical concepts in order to calculate the main kinetic parameters and acquire a "practical" grounding enabling correct drug use]*	***Bioavailability***	Compartmental models. Blood concentration-time curve for single or repeated administrations and different routes of administration. Area under the curve (AUC) for the different routes of administration. Phases α and β of the curve. Absolute and relative bioavailability; bioavailability for the different routes of administration.	
	Half-life Volume of distribution Body clearance	Half-life of the β-phase of the curve; determinant or modifying factors. Volume of distribution and body clearance: factors determining or altering them.	2
DYNAMICS *Description of the effects on the body by a drug [understanding drug ease-of-use, how this determines the drug primary action and any adverse (secondary and collateral) effects in order to enable correct, most appropriate drug choice for the patient's condition]*	***Drug mechanisms of action***	Drug mechanisms of actions. Primary, secondary and collateral action. Aspecific mechanism of action: diuretics and osmotic purgatives, laxatives, inhalational general anaesthetics, antiseptics and disinfectants, irritant hemetics, antacids.	1
	Dose-response curve	Enzymatic mechanism of action, specific, examples (beta-lactamics, sulfonamides, cardioactive glycosides, carbon anhydrase inhibitor diuretics, benzimidazole anthelmintics, quinolones, xanthines). Receptor structure and functions. Structure-activity relationships (affinity). Intrinsic activity. Agonism and antagonism. Competitive, non-competitive, functional and biological antagonism. Specific examples.	2
	Therapeutic index	Dose-response curves: quantitative and quantal approaches. Drug efficacy and potency. Effective Dose 50 and Toxic/Lethal Dose 50:	2

		significance, usefulness, determining factors. Therapeutic index and safety factors. Drug combination.	
		Factors that can alter drug action (pharmaceutical preparation, route of administration, interactions, individual and environmental factors, etc.).	1
Outline of statutory and regulatory provisions governing veterinary drug prescriptions	***Prescriptions and Pharmaceutical Preparations***	Drug prescriptions. Galenic prescriptions. Prescriptions for commonly used drugs, psychoactive drugs, for breeding animals. Galenic preparations.	2
CHEMOTHERAPY *Description of the importance of correctly choosing and implementing antibacterial therapy* *[understanding the concepts of "good use" of an antibacterial in order to optimize therapeutic action and contain antibiotic resistance]*	***Antimicrobials***	Criteria for choosing an antibacterial. Selectivity. Antibacterial mechanisms of action. Bacterial resistance to antibiotics.	1
		Beta-lactamines: spectrum and mechanism of action, ADME, toxicity, resistance, combination therapy. Sulfonamides and pyrimidine derivatives, spectrum and mechanism of action, ADME, toxicity, resistance, combinations.	3
		Macrolides and lincosamides, tetracyclines, aminoglycosides: spectrum and mechanism of action, ADME, toxicity, resistance, combinations.	3
		Phenicols, quinolones and fluoroquinolones, heterocyclic derivatives: spectrum and mechanism of action, ADME, toxicity, resistance, combinations. Antiseptics and disinfectants.	2

CHEMOTHERAPY *Description of the importance of choosing and implementing the right antiparasitic therapy*	***Anthelmintics*** ***Antiprotozoals*** ***Antifungals***	Anthelmintics: spectrum and mechanism of action, ADME, toxicity, combinations. Antiprotozoals and antifungals: spectrum and mechanism of action, ADME, toxicity, combinations.	2
ORGAN-SPECIFIC DRUGS Description of their pharmacological effects, clinical use and possible adverse effects [acquisition of the mechanisms of action, kinetic features and adverse effects, and an ability to choose the most suitable drug for the patient condition]	***CNS drugs***	Anaesthesia. Local and general anaesthesia. Pre anaesthetic medication.	2
		CNS depressants (psychotropics, benzodiazepines, barbiturates, anticonvulsants). CNS stimulants.	2
	Managing pain	Opioid analgesics. Non-narcotic analgesics.	1
		Non-steroidal anti-inflammatory drugs (NSAIDS) [analgesics, antipyretics, anti-inflammatories]. Steroidal anti-inflammatories.	2
	Heart treatment drugs	Treating congestive heart failure: cardioactive glycosides, ACE inhibitors, phosphodiesterase inhibitors. Diuretics. Antiarrhythmics.	2

PRACTICAL SESSIONS (Dott. Andrea Barbarossa)		
Subjects and skills acquired	**Specific Contents**	**Hours**
ACQUISITION OF AN ABILITY TO REASON, DEDUCE, LINK AND VERIFY Be able to put into practice - also with the use of mathematical calculations - the notions acquired during the frontal lessons, especially as regards the general section, and drug kinetics and dynamics [acquire the ability to execute very simple dilution, dosage and dosing-interval calculations in order to prescribe the correct amount of medicine; acquire practical knowledge of the most useful kinetic parameters for veterinary practice]	Doses and dilutions exercises	1
	Use of the withdrawal period calculator software, released by the European Medicines Agency (EMA)	1
	Draw up prescriptions (also for compounding) in compliance with legal provisions governing drug use in the veterinary setting	1
	Construction of plasma concentration-time curves and their use for the evaluation of the main pharmacokinetic parameters. Construction of dose-response curves and their use for the evaluation of pharmacodynamic aspects	1

SEE THE WEB-SITE OF THE COURSE TO KNOW THE CLASS SCHEDULE (LESSONS AND PRACTICAL ACTIVITIES