



Veterinary Medicine

AY 2019/2020



1st Year

Biochemistry (11 CFU)

Prof. Sergio Oddi

Biochemistry (11 CFU)

- Biochemistry of Metabolism and Enzymology (5 CFU)
- Biochemistry of Systems and Organs (6 CFU)

Objectives

Through this course, students will acquire good knowledge and understanding of the basic concepts of the enzymology relevant to the veterinary profession, including the familiarity with the structure and the general function of enzymes and the main metabolic pathways that operate in a living organism. Moreover, they will be able to describe the main enzymes of clinical diagnostic interest, as well as the main biochemical techniques currently used in diagnostics. Finally, they need to have adequate knowledge of the mechanisms that regulate and coordinate the metabolism between the various organs and systems of an organism as well as the main metabolic disorders, such as genetic metabolic disorders and metabolic syndromes.

Unit 1. Enzymology and metabolism (Biochemistry of Metabolism and Enzymology)

Enzymes. General properties of enzymes, enzymatic catalysis. Enzymatic kinetics

Enzymatic diagnostics. Main biochemical techniques (Western blot, ELISA, PCR and RT-PCR, micro-arrays). Bioenergetics. Glucose metabolism. Glycogen metabolism. Beta-oxidation of fatty acids

Cyclic acid cycle and oxidative phosphorylation. Biosynthesis of fatty acids. Ketogenesis. Urea cycle.

Unit 2. Biochemistry of tissues and organs (Biochemistry of Systems and Organs)

Biological membrane and transport systems. Biochemical feedback systems. Enzymatic cascades (kinase cascades, protease cascades). Bio-signaling systems (GPCRs, tyrosine kinase receptors, ligand-activated transcription factors and ion channels). Biochemistry of humoral immunity and blood coagulation. Biochemistry of the liver, adipose tissue, muscle, nervous tissue. Biochemistry of the skin. Biochemistry of digestion and rumen.



Chemistry and biochemical propedeutics (8 CFU)

Prof. Roberto Giacomini Stuffer

Prof. Marcello Mascini

- Propaedeutic biochemistry and elements of molecular biology
- Elements of Chemistry

Elements of Chemistry

Marcello Mascini

Introduction

This course unit aims at increasing the knowledge of basic chemistry highlighting the concepts useful for a career in veterinary sector. Thus, it allows students to be acquainted with a general chemistry overview as part of their general education requirements.

Students will learn the structures and reactions of elements, including oxygen, carbon, nitrogen and hydrogen that form the molecules seen as the building blocks of all living things.

An overview of topics such as inorganic and organic compounds, their electron structures and their properties, chemical reactions, solubility, acid-base equilibria, oxidation-reduction reactions along with principles of thermodynamics and kinetics will be given.

This course unit includes only hours in the classroom.

Unit 1. (from the 1st to the 5th hour). Chemical bonding and states of matter

Atoms and Atomic Masses. Atomic Structure. Periodic Table. Electronic Configuration of an Atom. Quantum Numbers and Energies of Electrons Shells, Subshells, and Orbitals. Electronic Structure and the Periodic Table. Molarity. Molarity Calculations Gases Pressure of Gases. The Combined Gas Law. The Ideal Gas Law. Liquids and Solids Properties. Phase diagrams.

Unit 2. (from the 5th to the 13th hour). Solutions. Chemical equilibrium. Acid-Base Equilibrium.

Buffer solutions. Oxidation-reduction reactions. Introduction of thermodynamics and kinetics Qualitative Concentration Terms. Mole Fraction. Equivalent. Normality. Equivalent Mass. Rates of Chemical Reaction. Chemical Equilibrium. Equilibrium Constant. The Brønsted-Lowry Theory. Acid-Base Equilibrium. Autoionization of Water. The pH Scale. Buffer Solutions. Oxidation-reduction reactions. Introduction of the principles of thermodynamics and kinetics.

Unit 3. (from the 14th to the 21st hour). Introduction to Organic Chemistry

Bonding in Organic Compounds. Structural, Condensed, and Line Formulae. Hydrocarbons. Isomerism. Radicals and Functional Groups. Physical and chemical properties and reactivity of Alcohols, Ethers, Aldehydes and Ketones, Acids and Esters, Amines, Amides.

Course unit organization and method of rating



The course unit management is through the web platform <http://elearning.unite.it/>. After signing up, students can download all the materials. The course unit planning, including the multiple-choice test schedule, will be given at the beginning of the course unit itself and uploaded on that platform. Students can download all the other materials (pdf files, software, excel files, and so on) during each class.

At the end of each unit, a multiple-choice questions (MCQs) test will be given to the students in order to evaluate their knowledge. Students that cannot take part in the tests can sit for a final examination always via a multiple-choice questions test or via an oral examination, as they prefer.

Objectives of the course unit

This course unit aims at providing students with the fundamental concepts of chemistry starting from the characteristics of the elements and their properties for the formation of bonds making up the complex organic molecules; as well as the study of the properties of matter and description of the most common chemical reactions such as acid-base and redox reactions. The concepts of equilibrium and kinetics of chemical reactions will be also examined. The most important classes of biological molecules – lipids, carbohydrates and proteins with the study of myoglobin, hemoglobin and proteins of the connective tissue – will be analysed from the point of view of structure and function. The aim is to provide both the necessary tools for learning topics concerning the metabolism and physiology of the animal treated in subsequent teaching activities, and to introduce the students to the basic knowledge about the organization of prokaryotic, eukaryotic cells, the flow of genetic information and gene cloning.

Propaedeutic biochemistry and elements of molecular biology (5 CFU)

Roberto Giacomini Stuffer

Objectives of the module

This module aims at providing the students with the organic chemistry fundamentals and the main properties of organic compounds of biological interest; We will examine from the point of view of structure and function the most important classes of biological molecules: lipids, carbohydrates and proteins with the study of myoglobin, hemoglobin and protein of the connective tissue.

The aim is also to introduce the students to the basic knowledge about the organization of prokaryotic, eukaryotic cells, the flow of genetic information and gene cloning.

The module of "Propaedeutic biochemistry and elements of molecular biology" is divided into two teaching units:

A) Teaching unit of Propaedeutic biochemistry

Lipids

Structure, properties and functions of lipids, classification, saturated and unsaturated fatty acids, their nomenclature, physical and chemical properties. The lipid reserves: the triacylglycerols, their



localization and biological functions. Fats and oils. The vegetable oils hydrogenation. The membrane lipids: phospholipids, glycolipids. Steroids. The aggregates of amphipathic lipids in water.

Carbohydrates

Structure, properties and functions of carbohydrates. The classification of monosaccharides. The chirality of monosaccharides. Enantiomers and epimers. Fischer projections of aldoses and ketoses up to six carbon atoms. Hemiacetals and hemiketals. The structures of pyranose and furanose monosaccharides, the anomers. Conventions for writing the cyclic structures of monosaccharides. The redox reactions of sugars. Acetals and ketals. The glycosidic bond. The disaccharides: maltose, cellobiose, lactose, sucrose. The animal polysaccharides: glycogen. The plant polysaccharides: starch and cellulose. The deoxysugars.

Amino acids, peptides and proteins

Classification and structural properties of the common amino acids found in proteins. The amino acids' stereochemistry and the acid-base properties. Structure and properties of the side chains of the standard amino acids, the disulfide bond, the modified amino acids. The peptides and the resonance of the peptide bond. The biological functions of proteins. The protein conformation. The primary structure. The secondary structures: alpha helix and beta sheet. The super-secondary structures. The domains and the tertiary structure. The quaternary structure. Simple and conjugated proteins. The Ramachandran plot and its significance. Fibrous and globular proteins. The macromolecular complexes. Protein denaturation and dissociation, the conformational changes. The relationship between structure and function.

Connective proteins

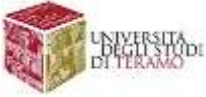
The proteins of the connective tissue. Functions of collagen. The tropocollagen. Collagen types. The melting temperature of collagen. Synthesis and structure of collagen fibers. The collagenase. Elastin: structure and function.

Myoglobin (mb) and hemoglobin (hb)

Transport and storage of oxygen: the role of Hb and Mb. The structure of the two molecules; globin winding. The mechanism of oxygen binding by proteins containing heme. The gene of the Mb. Proteins evolution: Mb and Hb as examples. Saturation curves of Mb and Hb with oxygen. The binding of carbon monoxide. The most important hemoglobins. The allosteric behavior of Hb and its regulation mechanism. The allosteric effectors. The Hill coefficient. From deoxy- to oxy-Hb: the allosteric transition. The saline bonds. The Bohr effect. Transport functions of Hb. The effect of bisphosphoglycerate, carbon dioxide and pH on oxygen binding. The adult and fetal Hb. The pathological Hb. The sickle cell disease: the molecular characteristics of this disease and the meaning of balanced polymorphism. The thalassemias.

B) Teaching unit of Molecular biology

Biological membranes



Structure of the cell membrane: properties and molecular constituents. Lipids and proteins in biological membranes. The fluid mosaic model. Integral and peripheral proteins. The membrane **proteins' solubilization**. The mobility of lipids. The fluidity of membrane. Temperature and composition effects on the fluidity. The membrane asymmetry. The membrane transport systems: passive, facilitated and active transport.

Molecular biology of prokaryotes

The two types of nucleic acids: ribonucleic acid (RNA) and deoxyribonucleic acid (DNA). DNA as the carrier of genetic information. The experiments demonstrating that genes are composed of DNA. The composition in the nitrogenous bases of DNA and the Chargaff rules. The theory of the double helix. Chemical structure and physical properties of DNA and RNA. The melting temperature (T_m), the denaturation, the size of the DNA molecules. The nature of semiconservative replication of DNA. The flow of genetic information. The gene-protein colinearity. DNA replication in prokaryotes. The DNA polymerase in *E. coli*. Enzymes and protein factors involved in replication. The replication stages: initiation, elongation and termination. The mutations and their relationship to carcinogenesis. Cellular systems of DNA repair. The transcription of DNA in prokaryotes. The RNA polymerase in *E. coli*. The start of transcription and its regulation. The promoter sites. The lengthening of the nucleotide chain: models to transcription bubble and surveyor caterpillar. The transcription term, rho-independent and rho-dependent factor. The messenger RNA. Protein synthesis in prokaryotes. The transfer RNA. The amino acids activation. The aminoacyl-tRNA synthetase. The genetic code and its important characteristics. The oscillation hypothesis. The ribosome and its molecular complex machine. The polyribosomes. The stages of protein synthesis: initiation, elongation and termination. The fidelity of protein synthesis. The post-translational modifications of the polypeptide chains.

Molecular biology of eukaryotes

Genes and DNA of eukaryotes. The structural genes and regulatory sequences. The repetitive sequences. Introns and exons. The spliceosome. The splicing mechanism. The physical and chemical structure of chromatin. The histonic basic proteins, nucleosomes and the regular structures of higher order of chromatin. DNA replication in eukaryotes. The nucleosomes assembly. The eukaryotic DNA polymerases. The transcription in eukaryotes. The eukaryotic RNA polymerase. General characteristics of the promoters. The transcription factors. The stimulatory sequences (enhancer). The transcription stages. The maturation of messenger RNA. The ribosomes structure in eukaryotes. The stages of protein synthesis in eukaryotes. Inhibitors of replication, transcription and protein synthesis in prokaryotes and eukaryotes.

Recombinant dna technology

Biotechnological applications of molecular biology. Restriction enzymes: major features and functions. The restriction-modification system. Restriction enzymes of type I, type II, and type III. The action mechanism of the restriction endonuclease *EcoRI*. The reverse transcriptase. RNA viruses. The retroviral infection of a mammalian cell and the integration of the retrovirus in the host chromosome. The retroviruses genes. The genome of avian sarcoma virus. The recombinant



DNA technology and its applications. The gene cloning: the principal methods, the main steps. The most commonly used cloning vectors in bacteria: plasmids, bacteriophages and cosmids. The colony hybridization. The genomic library. The mammal DNA cloning and expression in *E. coli*. Insertion and expression examples of eukaryotic genes in eukaryotic host cells. The site-specific mutagenesis. Materials and tools necessary to perform a PCR. The principle of PCR. The Taq polymerase. The sensitivity of PCR. The exponential nature of PCR. The necessary tools. The applications of PCR.

Assessment

Two written self-assessment tests and a final oral examination.

Office hours: every day by appointment.

Recommended text-books:

- H. Hart, *Chimica organica*, Zanichelli, Bologna;
- A.L. Lehninger, *Principi di biochimica*, Zanichelli, Bologna;
- L. Strayer, *Biochimica*, Zanichelli, Bologna;
- Harper's, *Biochimica illustrata*, EMSI, Roma;
- Lecture notes.



General and Topographic Veterinary Anatomy (12 CFU)

- Cytology, Histology, General and Topographic Anatomy I (4 CFU)
Paolo Berardinelli
- General and Topographic Veterinary Anatomy II (6 CFU)
Paolo Berardinelli
Alessandra Martelli
- Clinical and Instrumental Anatomy (2 CFU)
Luca Valbonetti

Cytology

In details, this course unit aims at treating the following: Cell Theory: Organization of living substance. Plasma membrane: structure and function. Glycocalyx. Endocellular membrane system: Endoplasmic reticulum, Golgi apparatus: function structure. Ribosomes. Vesicular transponder, Eso- and endocytosis. Core: structure and function; DNA and RNA nuclear proteins; nuclear membrane: nuclear pores and nuclear traffic; chromatin-nucleosome organization; Nucleolus. Structure and function of mitochondria; Lysosomes and Peroxisomes. Cytoskeleton: structure and function. Centres and Assonema - Epithelial tissue: lining and glandular. Classification of epithelia. Differentiation of the free surface (microvilli, cilia and stereociglia), both lateral and basal. Joints. Glandular epithelia. Secretion mode. Morphological classification of glands. Examples of exocrine and endocrine glands. Connective tissue. Cells and connective fibres. Proteoglycans. Fundamental substance. Classification of connective fabrics. Specialized structure and function of connective tissues: cartilaginous tissue; Bone tissue: Chondrogenesis and Osteogenesis; Striated, Cardiac and Smooth Muscle Tissue Blood. Structure and function. Nervous tissue. Myelin sheath. Nerve terminations: the synapses. Driving plates. Neuroglia. Oligodendrocytes.

Practical activities:

During the activities of reading the microscopic preparations, a microscope will be connected to the monitors. This allows teachers to explain the microscopic image in detail to the students.

Anatomy

This module consists in activities carried out in the anatomical classroom under the form of lectures, video projections concerning the dissecting anatomy and summary of the proposed images.

The teaching activities will be articulated in order to allow practical activities to be carried out with small groups of students. This allows the direct application of the projected skills. Additionally, videos showing in the normal order the techniques that allow the study of viscera, their conformation, their relationships, the means of fixity and their topography will be proposed.



Practical activities will take place under the direct guidance of the teacher. Practical classes will consist in a guided dissection of cadavers of domestic animals on the anatomical table so as to allow the anatomical planes as well as the notions of volume, consistency, colour and organ ratios to be appreciated. The preparations thus obtained will be the subject of discussion and comparison with the images obtained from common diagnostic practices (Endoscopy, Radiology, Nuclear Magnetic Resonance, Ultrasound, Computerized Axial Tomography).

The programme of this module will be based on the description, identification and comparison of the individual apparatus on the animal *in toto*. We will then proceed to the analytical description of the individual organs also with the support of the sector practice.

In details, the following topics will be treated: Anatomical terminology, main regions of the body and signs of osteology; Digestive system: general and comparative macroscopic aspects of the mouth, lips, vestibule, hard palate, soft palate, tongue, esophagus, peritoneum, laryngomas, stomach, small and large intestine, liver and pancreas. Respiratory system: nasal cavities, paranasal sinuses, larynx, trachea, bronchi, lungs, pleurae and mediastinum. Circulatory system: heart and pericardium; arteries and veins of the small and large circulation subject to macroscopic dissection. Urogenital system: macroscopic aspects related to kidneys, renal pelvis, ureter, bladder, female urethra. Male genital: epididymis, deferent duct, spermatic cord, male urethra and attached glands. Female genital: uterus, uterine tubes, female pudendal. Lymphatic system: macroscopic aspects of spleen and lymph nodes. Organization and macroscopic description of the nervous system of the relationship and autonomous life. Esthesiology: macroscopic aspects of eyes and ears.

Clinical and Instrumental Anatomy

Prerequisites

Basics of veterinary anatomy.

Objectives

At the end of the course students will have to:

- be able to integrate the knowledge of systematic anatomy in order to identify the position of **organs for approaching to the patients' clinical examination;**
- acquire skills to describe and analyse the topographic data, and the organization of the apparatus in the course of Systematic Anatomy;
- learn the methods of work, respect for the rules, the precision of the gestures that prepares students for surgical and clinical practice in general;
- demonstrate the basic knowledge necessary for the recognition and treatment of pathological cases;
- gain basic knowledge to follow the subsequent integrated courses with profit.

Exam programme

This course consists in field activities related to clinical anatomy. Teaching activities will be articulated in order to allow students to carry out the activities in groups of experts in the field.



The practical activities take place under the direct guidance of the teacher and consist in the identification of topographical anatomical projections of cavity viscera in domestic animals (monogastric herbivores, polygastric and carnivorous herbivores) in order to consolidate the morphological concepts, anatomical planes and the notions of volume of the organs.

The application knowledge of clinical anatomy will be the subject of discussion and comparison with images obtained from common diagnostic.

The programme of the course unit is based on the description, identification and macroscopic comparison of an individual apparatus on an animal *in vivo*.

In details, the following are also available:

Digestive system, Respiratory system, Circulatory system, Urogenital system, Elements of osteology.



Medical Physics and Statistics and its skills (10 CFU)

- Medical Physics (5 CFU)
Francesco de Pasquale
- Statistics and its skills (5 CFU)
Daniela Tondini

Medical Physics (5 CFU)
Francesco de Pasquale

1. Introduction
 - a. Units of measurement, International System
 - b. Sources of error: Random vs Deterministic, identification of significant figures
 - c. Dimensional Check
2. Basics on vectors and vectorial operations (decomposition, sum, difference, scalar and cross product)
3. Kinematics of material point
 - a. Speed and acceleration (average and instantaneous)
 - b. Uniform motion
 - c. Uniformly accelerated motion, two-dimension examples, projectile, free fall
4. Mechanics-Dynamics
 - a. **Newton's laws of Mechanics**
 - b. Force equilibrium, three types of levers
 - c. Biomedical applications (neck, foot and walking, arm, hip)
 - d. Rigid Body.
 - e. Centre of Mass, examples.
5. Force momentum, biomedical applications
6. Fluids. Static Fluids, definitions: Pressure and Density. **Archimedes' Principle, examples**
7. Fluid-dynamics
 - a. Continuity Law.
 - b. **Bernoulli's Law, biomedical applications: arterial Stenosis and Aneurism.**
8. Electromagnetism
 - a. Electric charge, Coulomb law, electrical field, examples
 - b. Electrical Potential
 - c. Intensity of current, Electrical Resistance
 - d. Magnetic Field, Lorentz Force.
 - e. Mass Spectrometry
9. Radiological Imaging, introduction and comparison. Basic principles of:
 - a. Computed Tomography (CT).
 - b. Echography.



c. Magnetic Resonance Imaging

Statistics and its skills (5 CFU)

Daniela Tondini

Module Objectives

The main objective of this module is to teach students the fundamental notions of Statistics and Informatics, preserving a "point of view" higher than Secondary School, with particular regard to applications in the veterinary sector, in order to put future graduates in the condition of knowing how to use some specific calculation tools.

Prerequisites

Algebraic calculation: set of natural numbers, relative and rational integers. The operations of "sum" and "product"; the relation of "minor or equal"; the subtraction; the division; the elevation to power and the notion of logarithm: calculation and main properties; maximum common divisor and least common multiple.

Use of a scientific calculator.

Analytical geometry: Cartesian plane, line and parabola.

Module programme

This module is divided into two parts, aimed at the acquisition of basic statistical and informatics knowledge, necessary to the degree programme in Veterinary Medicine: the first includes the basic notions of Statistics (2 CFU = 14h) and the second the first concepts of Computer Science (3 CFU = 21h).

First part: descriptive statistics

1. First notions of descriptive statistics: the phases of a statistical survey.
2. Characters, modalities, changeable statistics, statistical variables.
3. Collective phenomena, statistical surveys and statistical tables.
4. Graphic representations.
5. Statistical indexes of position: the mean (arithmetic, geometric, harmonic, quadratic), the median, the mode, the quartiles.
6. Statistical indexes of variability: the range, the average standard deviation, the coefficient of variation, the simple average deviation.
7. Analysis of errors.

Second part: basic computer science

1. Background: from the first computers to the birth of the PC; the binary numbering system; the basic changes; binary arithmetic.
2. Basic elements of computer science: basic components of a PC.
3. Use of Word as the most used writing method.



4. Elementary use of the spreadsheet for data processing (Excel): insertion of formulae and functions; creating a chart embedded on a worksheet.
5. Use of Power Point as a programme to create presentations.

Verification and Evaluation

During the module, two self-assessment tests will be carried out: all students (both attending and non-attending students) will have access to the first test; on the contrary, access to the subsequent self-assessment test will be allowed only to students who passed the previous ones.

The final evaluation of the students who passed both self-assessment tests (one for each teaching unit) will be the result of their arithmetic average, evaluated in thirtieths.

If the first self-assessment test is not passed and, consequently, the subsequent tests cannot be carried out, an overall written exam will take place one week before the examination date so as to allow the correction to be made and the students to have the opportunity to verbalize the grade achieved on the examination date itself – of the course unit – provided that they have been given a sufficient assessment even to the test of physics.

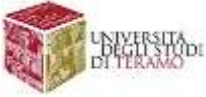
The sufficient evaluation of the Statistics and IT module will be kept for the entire academic year 2018/2019, or until the extraordinary session to be held in January/February 2020 (please refer to the exams' calendar by Prof. Francesco Di Pasquale).

Recommended Texts

- ✓ Tondini D., *Matematica, Statistica e Informatica*, Create McGraw-Hill Education, 2016 (available at Libreria Universitaria, Viale Crucoli 125, Teramo).

Optional Texts

- ✓ Deldossi L., Paroli R., *Lezioni di statistica*, Giappichelli, 2015.
- ✓ Invernizzi S., Rinaldi M., Comoglio F., *Moduli di Matematica e Statistica con l'uso di R*, Zanichelli, 2018.
- ✓ Iodice C., *Compendio di Statistica*, Edizioni Simone, Milano, 2007.
- ✓ Mecatti F., *Statistica di base: come, quando, perché*, The McGraw-Hill, 2010.
- ✓ Triola Marc M., Triola Mario F., *Statistica per le discipline biosanitarie*, Pearson, 2007.
- ✓ Curtin P.D., Foley K., Sen K., Morin C., *Informatica di base*, Mondadori, 2012.
- ✓ De Rosa A., Di Capua G., *Informatica di base*, Edizioni Simone, Milano, 2010.
- ✓ Sanna P.S., *Manuale di informatica di base*, Cedam, 2014.



Veterinary Zoology and Ethology (8 CFU)

- Veterinary Zoology (5 CFU)
Alessio Arbuatti
- Ethology (3 CFU)
Pia Lucidi

Veterinary Zoology (5 CFU)

Alessio Arbuatti

Teaching Unit 1

Week 1 Theoretical

Introduction, Prokaryota, Eukaryota, Autotrophic and Heterotrophic organism, Fundamentals of Taxonomy: species, subspecies, evolution of species, varieties-breeds

Week 2 Theoretical

Intraspecific hybrid, interspecific hybrid. Binomial classification, principles of systematic zoology and historical zoology books. Evaluative links among animals (diblastic, triploblasty, acoelomate, coelomate. Protostomata, deuterostomata)

Week 3 Theoretical

Genetic and cell reproduction, animal reproduction. Asexual reproduction: gemmation, binary scission, polyembryony). Mitosis Sexual reproduction and meiosis, hermaphroditism, parthenogenesis, metagenesis.

Week 4 Theoretical

Biosphere/ecosystems/biome/biotope, indigenous species, allochthonous species, invasive species. bioindicators. Migrations, biotic interactions: -Intraspecific-: gregarism, parental cares, cannibalism.

Week 5 Theoretical

Interspecific-: symbiosis: mutualism, commensalism, parasitism, competition. Use of colour and mimetism. Biodiversity, autotomy and regeneration.

Teaching Unit 2

Week 6 Theoretical

Platyhelminthes, nematoda, molluscae and arthropoda: crustacea

Week 7 Theoretical

Insecta, arachnida, fish

Week 8 Seminar + Practical lab

Reptiles and amphibian

Week 8 Seminar + Practical lab

Birds

Week 9 Theoretical

Mammals and laws



Ethology (3 CFU)

Pia Lucidi

Programme

History of ethology: who, when, how and what (men and women, time period, theories, application and results); methodology and procedure in the study of animal behavior; motivation; releasing stimuli and supernormal stimuli, phylogeny and ontogenesis of behavior; pheromones and vomer-nasal-organ; organization of the neuroendocrine system: testosterone and aggression, cortisol and attention; stress: function of adrenal gland, amygdala and hippocampus; animal welfare, transport and handling.

Animal cognition and neuro ethology: non-associative learning, associative learning, complex cognitive learning, reinforcement, punishment, shaping, superstition; imprinting, sexual imprinting, learning driven by instinct, song learning, spatial memory, conspecific recognition, social mind, theory of mind, audience effect, lying, deception, imitation, teaching, self-awareness, altruism, insight, detour, working memory, expectation cells, problem-solving and tool use in animals.

Natural behaviour, ethological and physiological needs of domestic animals: carnivores, cattle, sheep, horses, birds, rabbit and laboratory rodents.



2nd Year

Functional Veterinary Anatomy (7 CFU)

Pier Augusto Scapolo

Topics covered in functional veterinary anatomy

First Semester

Unit 1

1.1 Introduction to the course. The Nervous System.

1.1.1 Neuron anatomy. Neuromuscular junction. Peripheral and central nervous systems. The ontogenesis of the central nervous system.

1.1.2 The organization of gray and white spinal cord substance. Medulla oblongata, pons, midbrain: nuclei of the cranial nerves. The organization of the cerebellum: cortex, white matter, deep nuclei. The general organization of the diencephalon. Division of the thalamus and thalamic circuits. Hypothalamus, subthalamus, epithalamus: topography and functional divisions. Pineal gland. The hormones of the anterior lobe of the pituitary gland; posterior lobe of the pituitary gland. Relationship between the hypothalamus and pituitary gland.

Telencephalon: structural subdivision; overview of the functional circuits. The limbic system.

1.1.3 Sensory receptors: classification by location, by structure, by stimulus detected. Meissner's corpuscles, Pacinian corpuscles. Free dendritic endings. Proprioceptors: Golgi tendon organ, muscle spindle.

1.1.4 Spinal tracts

Ascending (sensory) pathways. Dorsal column pathway: fasciculus gracilis or cuneatus. Lateral column: spinocerebellar pathways; spinothalamic pathway.

Descending (motor) pathways: pyramidal (corticospinal) tracts; other motor tracts (extrapyramidal).

The functional organization of the visceral nervous system. Comparison of autonomic and somatic motor systems.

1.1.5

Microscopic structure of eyes and visual pathway. Microscopic structure of the inner ear and auditory pathway.

1.2 Muscular System.

1.2.1 Structure and organizational level of skeletal muscle. Somitic vs pharyngeal (branchial) musculature. Types of skeletal muscle fiber. Definition of motor neuron, motor unit, and recruitment.

1.2.2 Smooth muscle: single-unit (unitary) smooth muscle (cell-to-cell transmission via gap junctions), multi-unit smooth muscle (characteristics and examples).

1.2.3 Coverings and layers of the heart wall. Cardiac muscle cells and bundles; conducting system and innervation.

1.2.4 The circulatory blood system



The structure of blood vessels walls: the three layers (tunics). Comparing and contrasting the structure and function of arteries, arterioles, capillaries, venules and veins.

1.2.5 The integumentary system. Histological characteristics of the epidermis, dermis and hypodermis. Hair, associated glands, hoof and nails.

Unit 2

2.1 The lymphatic System

2.1.1 The lymphatic system. Intrinsic defense systems: lines of defense.

2.1.2 Lymphoid organs: microscopic structure of bone marrow, thymus, lymph node, spleen, tonsils, aggregated lymphoid follicles.

2.2 The urinary system.

2.2.1 The urinary system. Development of the urinary system: renal anlage, transitory structure. The structure of kidneys and the nephron.

2.2.2 Blood supply to the nephrons.

The adrenal glands (cortex and medulla).

2.2.3 Microscopic anatomy of the ureters, urinary bladder, urethra.

Visceral sympathetic and parasympathetic nerve fibers; somatic motor fibers. Involuntary detrusor and sphincter muscles, voluntary sphincter muscle.

Second Semester

Unit 3.1 The respiratory system

Structures of the respiratory system (conducting zones and respiratory zone)

3.1.1 External nose and nasal cavity (nasal conchae): microscopic anatomy. Respiratory mucosa and sense of smell (vomeronasal organ and olfactory pathway). The pharynx (nasopharynx). The guttural pouch

3.1.2 The larynx (cartilages, intrinsic and extrinsic muscles, glottis, vocal cords, false vocal cords): microscopic and functional anatomy.

3.1.3 Tracheal layers. The bronchi and bronchial tree subdivisions. The respiratory zone: describe the structure of the respiratory membrane.

3.1.4 The respiratory centers : the medulla (ventral and dorsal respiratory group) and the pons.

Peripheral and central chemoreceptors.

Thyroid and parathyroid glands: microscopic anatomy

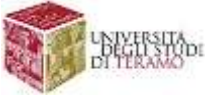
Unit 3.2 The digestive system

Organs of food processing activities (ingestion- propulsion- mechanical digestion- chemical digestion- absorption). Microscopic anatomical characteristics of the digestive organs: the mucosa- submucosa- muscularis externa- serosa (and adventitia). Nerve plexuses

3.2.1 Mouth (and mouth tissue); accessory organs (teeth, salivary glands); tongue: extrinsic skeletal muscles and taste buds. Central neural pathways. Morphological characteristics of chewing muscles.

3.2.2 Describing the general histology of the gastrointestinal tract

Pharynx (oropharynx and laryngopharynx). Pharyngeal constrictor muscles



Microscopic anatomy of the esophagus - Skeletal muscle vs smooth muscle.

Describing the structure of the stomach. Listing the cell types in the stomach. The structure of the stomach/reticulorumen (mucous membranes with or without glands).

Digestive anatomy in ruminants. The rumen, reticulum, omasum and abomasum: microscopic anatomy

3.2.3 Identifying the regions of the small and large intestine.

Describing the structure of the small intestine: circular folds- transverse ridges. Villi-enterocytes-microvilli-capillaries and lacteal lymph vessels. Intestinal crypts.

Microscopic anatomy of the large intestine

The anal canal

3.2.4 Liver

Microscopic anatomy: liver lobules, central vein and portal triads. Liver cells

Major vessels and ducts entering through the porta hepatis.

Gall bladder, pancreas.

Unit 4.1 The reproductive system

4.1.1 The ontogenesis of the reproductive system. Determination of genetic sex and prenatal development of male and female structures

4.1.2 The female reproductive system: the ovaries. Folliculogenesis and oogenesis. Corpus luteum and degenerating corpus luteum.

4.1.3 Uterine tube and uterus wall; vagina layers. Basic components of a mature mammary gland. Placenta: types, foetal and maternal surface

4.1.4 The male reproductive system: testes and seminiferous tubules. Spermatogenesis (compare to oogenesis).

4.1.5 Reproductive duct system in male. Accessory glands. The tissues of the penis.

Unit 4.2 Avian (gross) anatomy

Characteristics that define the Class of Birds (feathers, toothless beaked jaws, lightweight skeleton, etc.).

Main components of the locomotor system.

Identification of the most relevant organs in the nervous, endocrine, circulatory, immune, digestive, respiratory and urogenital systems



General animal breeding and **Economics (8 CFU)**

- General animal breeding and genetic improvement (5 CFU)
Paolo Pezzi
- Economics Applied to Animal Production (3 CFU)
Jorgelina Di Pasquale

General animal breeding and genetic improvement (5 CFU)

Paolo Pezzi

This module is divided into two lesson units:

The first unit deals with:

1. General information about animal husbandry
2. Morphological evaluation
3. Functional evaluation

The second unit deals with:

1. The genetic evaluation of livestock animals,
2. The Genetic Improvement
3. The ethnology.

Unit 1.

1.- General concepts concerning animal husbandry

- Age at puberty of different species
- Pregnancy duration of the different species
- Main livestock indexes for meat production.
- Livestock categories for pigs, cattle, sheep and goats.

2.- Morphological evaluation:

- Overview on animal morphology.
- Zoognostic glossary
- Morphological types in relation to the species and functional aptitude
- Hair coat description, classification and characteristics
- Animal body regions, description, anatomical basis, limits, borders, merits and defects with particular attention to equine specie.
- Perpendicularity: definition, evaluation and evaluation aims.

3.- Functional evaluation



Reproductive activity: reproductive performance parameters on bovine, swine and ovine species. Factors affecting reproductive performances. Guidelines and optimal values of these parameters on different species and aptitudes.

Meat production: main parameters and indexes.

Milk production: General morphological characteristics of dairy cattle, general aspect, body capacity, udder, milk yield attitude. Milk quality parameters for genetic improvement.

Unit 2.

1. Genetic Improvement:

Overview of basic genetic. Qualitative traits. Mendel's principles of inheritance. Exceptions to Mendel's principles. inheritance transmission of quantitative traits, variability, genetic and environmental variability. Heritability. Genetic evaluation of breeders. Kinship and kinship coefficient. Estimation test of the genetic value based on the phenotype of the ascendants (pedigree), of the individual itself (performance), of the collateral (SIB), of the descendants (PROGENY). Estimate based on the phenotype of different categories (COMBINED) or on the basis of all the available phenotypes (ANIMAL MODEL).

Genetic progress. Factors affecting genetic progress. The genetic indexes. The reproduction methods. Discipline of animal reproduction and genetic improvement. Selection. Consanguinity, coefficient of consanguinity, problems related to consanguinity. The crossing. Crossing schemes and objectives. The eterosis. The commercial hybrids.

2. Ethnology:

As for the Italian Friesian and Piedmontese bovine breeds and the main swine breeds reared in Italy, it will be evaluated: the morphological aspects, the functional check methods, the functions of herd-book, the genetic tests, and the genetic development programme.

For each breed (reared in Italy) belonging to the species

- Horse
- Donkey
- Bovine
- Swine
- Ovine
- Caprine
- Dog
- Cat

elements concerning their origin, attitude, diffusion, morphological description and the performances will be supplied.



Economics Applied to Animal Production (3 CFU)

Jorgelina Di Pasquale

The *Economics Applied to Animal Production* module is designed to transfer to the student the economic knowledge useful for business management. Through the analysis of the decision-making process of a company and of the main economic and organizational variables that influence its management, students will be able to understand the entrepreneurial choices also in relation to the economic and institutional context in which that company operates.

The examination programme will cover the following topics:

- Principles of economics (demand, supply, market, consumer)
- The institutional context and policies of sector
- Accounting
- Management
- The business plan

Recommended text-book

Biancamaria Torquati, *Economia e gestione dell'impresa agraria. Il processo decisionale, il sistema informativo aziendale e gli strumenti di controllo*, Edagricole, 2015



General Veterinary Pathology and Pathophysiology (6 CFU)

Giovanni Di Guardo

Exam Programme

Introduction to and objectives of the Course OF "*General Pathology and Veterinary Pathophysiology*". Teaching activities and exam programme, along with suggested textbooks.

Definition and aims of "General Pathology and Veterinary Pathophysiology". Concepts of "aetiology", "pathogenesis", homeostasis", "health" and "disease" (including classification of "disease processes" in relation to their degree of biological complexity).

Classification of disease-causing agents/factors: extrinsic/exogenous causes, intrinsic/endogenous causes, essential, sufficient and insufficient causes, predisposing factors, cofactors, multifactorial aetiology (with related examples).

Apoptosis, necrosis, autophagy, cell aging and senescence (including basic elements of "submicroscopic pathology"). Intrinsic/endogenous/hereditary disease causes: hereditary/familial disease conditions and congenital/inborn disease conditions (with related examples).

Neoplastic transformation: Definition of neoplasia, basic concepts and related etio-pathogenetic theories. Evolutionary history of neoplastic processes, including "metastatic behaviour" and "tumour metastatization". "Grading" and "staging" in tumour classification as well as in tumour "diagnostic" versus "prognostic" evaluation. Paraneoplastic syndromes.

Physical disease causes, with a special emphasis on radiation as well as on radiation-induced carcinogenesis (with related examples).

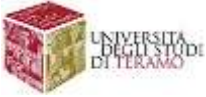
Chemical disease causes (both "natural" and "anthropogenic"), with a special emphasis on chemical carcinogenesis (with related examples). Environmental pollutants, together with "bioaccumulation" and "biomagnification" processes along the "food chain(s)/web(s)". Concept of "apex/top predator" species (with related examples).

Biological disease causes (protozoan and metazoan parasites, unicellular *algae*, fungi, Gram-positive and Gram-negative bacteria, etc.), with special emphasis on viruses and prions as well as on viral carcinogenesis (with related examples). Koch's postulates. "Direct" and "indirect" laboratory techniques for the detection of microbial pathogens and/or infections.

Inflammation: definition, general features, "cardinal signs" of inflammation, pro-inflammatory agents, fluid and cell fractions/components of inflammatory oedemata. Chemical mediators of inflammation. Febrile and non-febrile hyperpyrexia. Acute, subacute, chronic, productive and granulomatous inflammation. Foreign body granulomas, infectious and parasitic granulomas.

Cell and tissue repair mechanisms/pathways (basic concepts).

Relevance and utility of "Pathophysiology" for an adequate identification/recognition and understanding of the clinical signs characterizing the disease processes affecting the various host's apparatus, organs and tissue districts.



Cardiovascular system pathophysiology (along with body salt and fluid homeostasis and pathophysiology): Pathophysiology of *oedema*. Pathophysiology of shock.

Pathophysiology of blood disorders: Anemias, regenerative *versus* non-regenerative/hypo-regenerative anemias (including their prognostic relevance).

General immunopathology and types/categories of immunopathologic alterations: primary and secondary (acquired) immunodeficiencies; hypersensitivity reactions ("immediate" and "delayed" reactions), according to "Gell-Coombs classification scheme"; autoimmunity and autoimmune disease, with related examples. Host's immune surveillance against neoplasia.

Stress pathophysiology.

Acid-base homeostasis (basic concepts). Kidney and liver pathophysiology (basic concepts).

Respiratory and digestive pathophysiology (basic concepts).

Plenary discussion on the topics delivered during the teaching activities.

Veterinary Microbiology and Epidemiology (7 CFU)

- Veterinary Microbiology (5 CFU)



Pietro Giorgio Tiscar

- Veterinary Epidemiology (2 CFU)
Cristina E. Di Francesco

Veterinary Microbiology (5 CFU)

Pietro Giorgio Tiscar

Programme

Introduction. Prokariota, Prokariota classification. Prokariote cells: the nucleoid, the cytoplasm, the cell membrane, the cell wall, the bacterial capsule, the flagella, the pili, the spore and sporulation. Bacterial growth factors: the nutrients, water, temperature, pH, oxygen. The bacterial growth curve. **Bacteria study techniques. Germs' pathogenic mechanisms. Antibiotic resistance.** The horizontal gene transfer.

Viruses, virus classification. Virus study techniques. The viral morphology. The DNA virus replication. The RNA virus replication.

The organisms' defensive systems. Natural immunity. The antigen. The immune system. **The antibodies' production. The antibodies' production control. The polyclonal and monoclonal antibodies.** Seropositivity. Serological tests: sero neutralization, agglutination, precipitation tests, immunofluorescence test, immunoenzymatic tests. The cell mediate immunity. The immune response to pathogens. The natural passive immunity. The artificial passive immunity. The artificial active immunity. Vaccine utilization.



Veterinary Epidemiology (2 CFU)

Cristina E. Di Francesco

General concepts and principles: objectives, definitions, types and uses of epidemiology.

Patterns of a disease: **epidemic, endemic, sporadic disease**. **Causes of a disease: Koch's and Evans' postulates**. **Variables and types** of association. Causal models. Formulating a casual hypothesis.

Determinants of disease: Classification. Agent determinants. Host determinants. Environmental determinants.

The transmission and the maintenance of infections: Horizontal and vertical transmission. Routes of infection and transmission. Maintenance of an infection.

Describing a disease: The structure of populations. Measures of disease occurrence. Prevalence, Incidence, Mortality, Lethality and Survival.

Surveys: Nature and Source of data. Sampling and types of sampling. Bias.

Observational studies: Cohort, case-control and cross-sectional studies. Measures of association: Relative risk. Odds ratio.

Evaluation of diagnostic testing: Sensitivity, specificity. Predictive value. Multiple testing. Repeatability of diagnostic tests.



Veterinary Pharmacology (6 CFU)

Giancarlo Palumbo

The study of pharmacology. General principles of drugs, routes of drug administration. The ADME processes: Absorption, Distribution, Metabolism, Excretion.

Pharmacokinetics: its parameters, compartmental models, multiple dosing regimens, physiological and disease states.

Pharmacodynamics: action mechanisms of drugs, drug-receptor interaction and quantitative response to drugs; main classes of receptors and their signal transduction systems, agonists, partial agonists, antagonists; receptor antagonism, functional and chemical; dose response curve; tolerance mechanisms and drug dependence; drug-allergy, idiosyncrasy, tachyphylaxis and adverse drug reactions.

Drugs acting on the SNA, CNS, circulatory system, respiratory system, kidney and urinary system, gastrointestinal tract. Coagulation drugs, anti-inflammatories, autacoids, psychotropics, antibiotics and chemotherapeutics, antifungal, anthelmintic, antiprotozoal, ectocides, antiseptics and disinfectants.



Veterinary Physiology I (6 CFU)

Pasqualino Loi

General Physiology. Function and structure of cells, cell differentiation, cell metabolism. Cell membrane and ion flux across it, resting/action potential. Receptors, structure, ligand, interaction with, agonist and antagonists, concepts.

Nervous system. Neurons, electricity as a communication tool, action potential neuronal facilitation. Glial cells. Haemato-Cerebral barrier. Cerebral-spinal fluid: production, drainage and function. Generation and conduction of potential action in nerve fibers. Myelinic fiber, saltatory conduction. Types of synapsis. Excitation and inhibition in synapsis. Neurotransmitters, Types of and properties of receptors. Potential receptor, adaptation, phasic and tonic receptors. Spinal reflexes. Neuromuscular spindle. Mono/poly synaptic reflexes. Ascending fibers. Neo/archeo-spinothalamic ways. Thalamus and its function as a relay. Somatosensory cortex, composition and function. Homunculus. Pain, general definitions. Visceral and somatic pain. Endogenous opioids. Electroencephalogram. Sleep induction and regulation. Equilibrium control. Vestibular organ, nuclei, fiber and neuronal centres dealing with equilibrium. Efferences. Motor cortex: organization. Pyramidal and extra pyramidal systems. Autonomous Nervous System: parasympathetic, ortho-sympathetic. Neuronal organization. Effects of neurotransmitters. Control of main organic functions. Mesencephalon, hypothalamus, limbic system. Memory.

Skeletal muscle. Neuro-muscular junction. Excitation of muscle fibers. Organization of muscle fibers. Contractile proteins and sliding mechanisms. Type of skeletal muscle, muscle contraction. Isotonic and isometric contraction. Muscle tetanisation. Metabolism.

Smooth muscles. Types of smooth muscles: classification and main differences. Multi-, mono-, unitary smooth muscle fibers. Distribution and differential elements. Organization of contractile proteins in smooth muscles. Excitation and contraction in smooth muscles.

Blood and body fluids. Blood composition. Plasma and corpusculated cells. Composition and function of plasma components. Plasma proteins. Determination and physiological variation of haematocrit. Red blood cells. Hemopoiesis. White blood cells. Haemostasis, blood clotting.

Cardio-circulatory system. The heart as a pump. Overview of the general circulation. Cardiac cycle and associated events. Generation and propagation of the potential action: physiological pacemakers. Conduction system and its main failures. Cardiac output, physiological variation. Frank-Starling principle. Systole and diastole. Cardiac sounds. Main features of electrocardiogram. Sphygmic wave. Blood pressure/velocity relationship. Factors inducing blood pressure variation. Microcirculation. Structure and function of meta/ arterioles, capillaries, pericytes, pre-capillary sphincters. Blood-tissue exchanges: mechanisms. Local factors in regulation blood flow. Lymphatic system. Capillaries, main lymphatic vessels. Venous return:



mechanisms. Foetal Circulation and its post-natal changes. Regulation of cardiac activity. Short-, medium- and long-term mechanisms to control blood pressure. Cardiac insufficiency.

Thermoregulation: brief concepts.

Kidney and body fluid composition. Kidneys: overview and main differences among animals. Gross functional organization. Circulation in kidneys. The nephron: how it is made up and organized. Urine is the end product of glomerular filtration of plasma; Tubular Resorption of ultrafiltrates; tubular secretion. Details of the three main mechanisms. Blood pressure regulation in kidneys. Juxta-glomerular apparatus. Renin-angiotensin, aldosterone axis. Loop of Henle; fundamental functional elements. Osmotic gradient in medulla: how it is made up. Fine regulation of urine composition. Water balance. Hypothalamic osmo-receptors. Antidiuretic hormones. Urine transport in ureters. Bladder filling. Urination reflex. Ways and centres. Urine composition in different species.

Acid-Basic balance. Classification of organic buffers. Sodium bicarbonate, Acid Phosphate, Ammonia. H secretion, sodium bicarbonate resorption in proximal tubule. Ex-novo synthesis of sodium bicarbonate.



Veterinary Physiology II (9 CFU)

- Veterinary Physiology II
Nicola Bernabò
- Endocrinology
Nicola Bernabò

Veterinary Physiology II
Nicola Bernabò

Prerequisites
Propedeutical courses

Objectives

At the end of this course students will have acquired updated knowledge on:

- **the functions of physiological systems relevant for the veterinary practice**
- **integration of organ and system functioning with changes in internal and external conditions in order to understand the systemic control and the homeostatic mechanisms of the organism;**
- **problems arising from the loss of the normal function of systems;**
- **strategies aimed at maximizing the function of systems, for economic purposes in the main species of zootechnical interest or for therapeutic purposes in pets.**

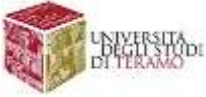
Programme

Respiratory function and the respiratory system.

Introduction on the functions of the respiratory tract; distribution, diffusion and perfusion of atmospheric air in the respiratory tract, pulmonary ventilation, respiratory mechanics, pulmonary circulation. Respiratory exchanges, ventilation-perfusion ratio, hypo- and hyperventilation. Oxygen transport in blood, haemoglobin dissociation curve, transport of carbon dioxide in blood, transport of gases during muscular exercise. Chemical and nervous control of respiration, hypoxia and respiratory adaptations. Non-respiratory functions of lungs. Defence mechanisms of the respiratory system, thermoregulation, acid-base homeostasis and metabolic function of lungs.

Gastrointestinal physiology in monogastric animals.

Regulation of the gastrointestinal function: autonomic nervous system, enteric nervous system, endocrine system, immune system. Comparative study of motor activity of the gastrointestinal tract, electrophysiological characteristics of gastrointestinal smooth muscle, mastication, swallowing, mechanical functions of the stomach, vomiting reflex, motor activity of the small intestine, coecal ileum sphincter, colon and sphincter rectus reflex. Secretory activity of the digestive tract, salivation, gastric secretion, pancreatic secretion, biliary secretion. Digestion and



absorption in non-fermentative processes: microscopic organization of the gastrointestinal tract, composition of diet for monogastric animals, physical degradation of food, enzymatic degradation of carbohydrates, proteins and food lipids along the digestive tract. Mechanisms of intestinal absorption of monoses, amino acids and lipid micelles. Transfer of nutrients absorbed by the intestinal epithelium to intestinal blood-lymphatic flow. Absorption of water, electrolytes, trace elements and vitamins. Digestion in newborn individuals, functional development of the intestinal epithelium from birth to weaning and pathophysiology of diarrhea.

Gastrointestinal physiology in ruminants.

Advantages and disadvantages of fermentative digestion, sites of fermentative digestion, rumen microbial ecosystem, chemical-physical control of fermentative digestion, metabolic pathways involved in fermentative digestion, substrates (carbohydrates, proteins, lipids, urea) and fermentation products, mechanism of fermentation absorption of volatile fatty acids and fermentation products. Reticulo-ruminal motility: simple motor cycle, belching, rumination, mechanisms of control of the reticulo-ruminal motility, functions of humus. Rumen development and esophageal shower function. Functions of the large intestine in equidae.

Homeostasis of metabolic energy sources.

Recalls of the biochemical cycles in using energy sources, main energy sources, transport mechanisms, molecules and sites for depositing energy sources. Endocrine framework and mechanisms of using nutrients in the various metabolic phases of an organism: absorbing, interprandial and prolonged fasting phases. Comparative analysis of energy metabolism in carnivores, omnivores and ruminants.

Reproductive system

Female reproduction:

Neuro-endocrine control of ovaries, oestrus cycle, ovulation, fertilization, gestation and labour, in species of veterinary interest.

Male reproduction:

Neuro-endocrine control on testes, spermatogenesis, spermiation, epididymal maturation of spermatozoa, ejaculation, semen deposition within the female genital tract.

Endocrinology
Nicola Bernabò

Prerequisites



Propedeutical courses

Objectives

At the end of this module students will be able to master the endocrine mechanisms that govern the systemic functions in order to understand the physiology of the digestive, respiratory and reproductive systems of domestic animals.

Programme

Topics

Definition of hormones, correlation between nervous and endocrine control of cellular and tissue functions, synthesis of hormones, blood transport of hormones, mechanism of action of hormones at the cellular level, mechanisms of intracellular transduction of hormonal stimulation, metabolism of hormones, mechanisms of control of hormone synthesis, hypothalamus-hypophysis axis, role of neurohypophyseal hormones, role of adenohypophyseal hormones.

Endocrine glands and their functions.

Thyroid: synthesis of thyroid hormones, mechanisms of control of the synthesis and release of thyroid hormones, blood transport, cellular interaction of thyroid hormones, degradation, role of thyroid hormones during growth and in an adult organism, effects of the hypo- and hyperthyroidism, substances with thyrostatic action.

Adrenal glands: hormones synthesized in the medullary and cortical components of the adrenal gland, synthesis of minerals, glycocorticoids and sex steroids, transport of blood into the steroid hormones, mechanisms of action of glycocorticoids at the cellular level, degradation, mechanisms of control of the synthesis of glycocorticoids, metabolic functions and pharmacological properties of glycocorticoids. Recall of the functions of mineralocorticoids and catecholamines.

Endocrine pancreas: the general functions of insulin, glucagon and somatostatin, insulin synthesis, mechanisms of control of synthesis, blood transport, interaction of pancreatic-receptor hormones and intracellular transduction mechanisms, metabolic actions of insulin, sites of insulin action (dependent and independent insulin tissues), diabetes mellitus, glucagon synthesis, control mechanisms of synthesis, blood transport, glucagon metabolic role.

Calcium-Phosphorus metabolism: role of calcium and phosphorus in cellular and tissue function, general mechanisms of control of calcium and phosphorus homeostasis. Parathyroid hormone: synthesis and control mechanisms, blood transport, hormone receptor interaction and intracellular transduction mechanisms, role of parathormone and sites of action. Calcitonin:



synthesis and control mechanisms, blood transport, intracellular transduction mechanisms, role and sites of action. Vitamin D: synthesis and activation, blood transport, role and sites of action.

Physiology of reproduction

Development of the reproductive system, outline of fetal and postnatal gametogenesis, hypolamo-hypophysis-gonadal axis and hormonal bases for controlling reproductive functions, external factors that control the reproductive functions. Female: comparison between the reproductive cycles of domestic mammals, transition from prepuberty to puberty, ovarian cycles, ovarian cycle phases and endocrine control profile. Follicular phase: development of the ovarian follicle, estrogen synthesis and their control, peak of the gonadotropins and ovulation, comparison of estrous behaviour, artificial coupling and insemination, pharmacological management of the follicular phase (methods and purposes of the induction treatments for ovulation and superovulation). Cyclic corpus luteum: functional and morphological luteinization, progesterone synthesis and its control, endocrine role of progesterone on different sites of action, mechanisms of luteolysis, synthesis of prostaglandins F₂ alpha. Gravity luteum body: maternal pregnancy recognition mechanisms, chorionic gonadotropins, diagnosis of hormonal and instrumental pregnancy. Pregnancy: synthesis and role of progesterone during pregnancy, role of placenta, duration of pregnancy in different animal species of zootechnical interest, other hormones of pregnancy. Childbirth: prodromal clinical signs of childbirth, comparative study of endocrinology of childbirth, pharmacological induction of childbirth in different animal species of zootechnical interest. Postpartum: lactation anesthesia and post-partum anestros.

Lactation

Recall of the comparative organization of the mammary gland, mechanisms of mammogenesis control, endocrine mechanisms that drive lactogenesis and galactopoiesis. Colostrum and milk secretion, lactation cycle, milk ejection, managerial control of lactation.



3rd Year

Animal nutrition and feeding (10 CFU)

- Animal nutrition and feeding
Alessandro Gramenzi
- Animal Feeding
Isa Fusaro

Animal nutrition and feeding
Alessandro Gramenzi

Water

- biological role;
- water balance in animal species of zootechnical interest;
- potability of drinking water for livestock.

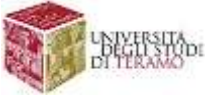
Food and nutritive principles

- Carbohydrates: classification, general properties, structural and non-structural carbohydrates, role of fibers in the diet of monogastric animals, concept of prebiotic and probiotic, evolution of analytical methods for estimating the fiber content of foods: Weende, Van Soest and dietary fiber.
- Lipids: classification, general properties, essential fatty acids, omega6 and omega3 fatty acids, fat oxidation;
- Proteins: classification, general properties; amino acids, essential amino acid, critical amino acid, biological value of proteins, "ideal protein".
- Minerals: macro and microelements, functions performed, sources, doses and toxicity.
- Vitamins: water-soluble and fat-soluble, functions performed, sources, doses and toxicity.
- Analytical techniques for the evaluation of the chemical characteristics of foods.

Nutrition of ruminants

- references to rumen physiology and microbiology;
- energy metabolism of the rumen: fermentation of carbohydrates in the rumen, production of volatile fatty acids, molar concentration of volatile fatty acids in rumen and their productive exploitation; digestive utilization of the fiber, physically effective fiber;
- protein metabolism of rumen: protein degradation, bacterial proteosynthesis, use of non-protein nitrogen in ruminants;
- lipid metabolism of rumen: bacterial use of fats, ruminal biohydrogenation.
- Ruminal metabolism, host animal metabolism and methanogenesis.

Nutrition of domestic carnivores



- An outline of physiology of the gastro-enteric tract;
- nutritional peculiarities of carnivores;
- role of food and nutritive principles in the nutrition of carnivores

Digestibility of foods (estimation methods in monogastric animals and ruminants)

Bioenergetics

- use of energy by an animal organism;
- direct and indirect methods of assessing the energy value of a certain food in monogastric animals and ruminants.

Protein value of a food (monogastric animals and ruminants)

Animal Feeding

Isa Fusaro

Theoretical lessons

Introduction to animal feed; main foodstuffs in animal nutrition: corn silage and alfalfa hay; [forage conservation, storage and feeding](#); [forage conservation, storage and feeding](#); animal feed; feeding technique; feeding legislation; animal rations; requirements for dairy cattle; rations for young calves; rations for dairy cattle; rations for dry cattle; a practical approach to rationing for dairy cattle; rations for beef cattle; rations for small ruminants; rations for pigs; rations for small animals.

Practical lessons

Study of feeds

Practical approach to rationing for dairy cattle

Practical approach to rationing for beef cattle

Practical approach to rationing for small ruminants

Practical approach to rationing for pigs

Practical approach to rationing for dogs and cats



Infectious diseases, prophylaxis and police employed in veterinary health (10 CFU)

- Infectious diseases, prophylaxis and police employed in veterinary health I
Barbara Di Martino
- Infectious diseases, prophylaxis and police employed in veterinary health II
Fulvio Marsilio
- Poultry diseases
Cristina E. Di Francesco

Infectious diseases, prophylaxis and police employed in veterinary health I Barbara Di Martino

Requirements: knowledge of Veterinary Microbiology and Epidemiology I and General Pathology and Veterinary Pathophysiology

Objectives: acquiring skills on the etiology, epidemiology, pathogenesis, diagnosis, prophylaxis and control of the main infectious diseases in pets and livestock.

Programme: Canine parvovirus (CPV-2); feline parvovirus (FPV); canine leptospirosis; canine herpesvirus (CHV-1); canine adenoviruses: (CAV-1 e CAV-2); rabies; canine monocytic ehrlichiosis; feline retroviruses: feline leukaemia virus (FeLV) and feline immunodeficiency virus (FIV); canine distemper virus; upper respiratory tract disease (U.R.T.D) of cats: feline calicivirus (FCV), feline herpesvirus (FHV-1) and *Chlamydia felis*; feline infectious peritonitis (feline coronavirus); rabbit infectious diseases: myxomatosis and rabbit haemorrhagic disease; enzootic bovine leucosis; bovine tuberculosis; anthrax (*Bacillus anthracis*); tetanus (*Clostridium tetani*); ovine enzootic abortion (*Chlamydia abortus*); bovine herpesvirus 1 (BHV-1); bovine spongiform encephalopathy (BSE); scrapie.

Recommended books:

- M. Thrusfield, *Veterinary Epidemiology*, II Edition, Ed. Blackwell Science.
- Scatozza F, Farina R. (1998): *Trattato di Malattie Infettive degli Animali*. UTET, Torino.
- Hirsh D.C., MacLachlan N.J., Walker R.L. (2004): *Veterinary Microbiology*, Blackwell Publishing.
- Regolamento di Polizia Veterinaria 320/54 e successive modifiche
- Lecture Notes and slides.

Infectious diseases, prophylaxis and police employed in veterinary health II Fulvio Marsilio

Principles of pathogenesis, laboratory diagnosis and preventive medicine of animal infectious diseases. The monitoring scenario in Italy, Europe (TRACES system) and worldwide (OIE).



Respiratory infections in equines (strangles, flu, equine rhinopneumonitis, equine arteritis). Equine Infectious Anemia. Glanders. West Nile Disease. Foot and Mouth Disease, Swine vesicular disease. Classical and African swine fever. Aujeszky disease. Swine flu. Swine mycoplasmosis. Swine Erysipelas. Swine atrophic rhinitis. Bovine mastitis. Ruminant clostridiosis. Brucellosis. Bovine Viral Diarrhea. Malignant catarrhal fever. Contagious bovine pleuropneumonia. Ovine mycoplasmosis. Poxvirus infections of sheep: ovine pox, contagious pustular dermatitis of sheep. Retrovirolosis in small ruminants: visna-maedi, caprine arthritis, encephalitis. Blue Tongue. Salmonellosis

Books

M. Thrusfield, *Veterinary Epidemiology*, II Edition, Ed. Blackwell Science. - Scatozza F, Farina R. (1998): *Trattato di Malattie Infettive degli Animali*. UTET, Torino. - Hirsh D.C., MacLachlan N.J., Walker R.L. (2004): *Veterinary Microbiology*, Blackwell Publishing. - www.quadernodiepidemiologia.it/epi/HomePage.html - - Regolamento di Polizia Veterinaria 320/54 e successive modifiche. - Lecture Notes.

www.oie.int

http://www.salute.gov.it/portale/temi/p2_3_animali.html -

http://ec.europa.eu/food/animal/index_en.htm

Poultry diseases

Cristina E. Di Francesco

Principles of biosecurity in poultry flocks: Cleaning and disinfection procedures

Bacterial diseases: Salmonellosis (Fowl typhoid, Pullorosis) ; Avian Cholera; Infectious Coryza; Mycoplasmosis (*M. gallisepticum*, *M. meleagridis*, *M. sinoviae*); Colibacillosis; Chlamydiosis.

Viral diseases: Infectious laryngotracheitis (ILT); Avian influenza; Newcastle disease; Infectious Bronchitis; Infectious Bursal disease; Marek disease; Leukosis/Sarcoma (L/S) group diseases.



Parasitology and parasitic diseases in veterinary medicine (10 CFU)

Donato Traversa

Background

General pathology and veterinary physiopathology.

Objectives

Providing the main theoretical and practical notions on infections and infestations of veterinary and zoonotic interest: etiology, biology of etiologic agents, epidemiology, pathogenesis, symptomatology, pathological anatomy, diagnosis, therapy and prophylaxis.

Programme

Infections and infestations of veterinary and zoonotic interest: etiology (morphometric and morphological characteristics of parasites), biology and biological cycles, epidemiology, pathogenesis, symptomatology, clinical and laboratory diagnosis, anatomopathological lesions, therapy and prevention.

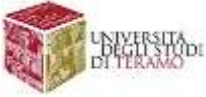
Host-parasite relationship.

Survival strategies of parasites in their hosts. Activity of parasites in hosts. Hosts reactions to parasites. Immunology of parasitic diseases. Habitat of parasites. Routes of entry and exit of parasites.

Prophylaxis and Treatment. Strategies to fight and control parasitic diseases. Direct prophylaxis: interruption of biological cycles through disinfection, disinfestation, isolation. Indirect prophylaxis: general concepts of chemotherapy, chemoprophylaxis, immunoprophylaxis.

Protozoa infections: Salivaria and Stercoraria trypanosomes. Dourine (*Trypanosoma equiperdum*), Leishmaniosis (*Leishmania infantum*), Toxoplasmosis (*Toxoplasma gondii*), Neosporosis (*Neospora caninum*), Examitosis (*Hexamita meleagridis*), *Entamoeba histolytica*, *Hepatozoon canis*, Trichomonosis in cattle and cats (*Trichomonas* spp., sin. *Tetratrichomonas* spp.), Histomonosis (*Histomonas meleagridis*), Coccidiosis in dogs, cats, cattle, sheep, goats, rabbits, chickens, turkeys, anatids) (*Eimeria* spp., *Cystoisospora* spp.), (dogs, cats, Giardiosis (*Giardia* spp. and genotypes), Cryptosporidiosis (*Cryptosporidium* spp.), Sarcocystosis (*Sarcocystis* spp.), Babesiosis in cattle, sheep, goats, pigs, horses, dogs, cats (*Babesia* spp.; *Theileria* spp.; *Cytauxzoon felis*), Theileriosis (bovine, sheep, goats).

Trematoda Infestations: Fasciolosis (*Fasciola gigantica*, *Fasciola hepatica*, *Fascioloides magna*), Dicroceliosis (*Dicrocoelium dendriticum*), Schistosomiasis (*Schistosoma* spp.), hepatic trematodosis of carnivores (*Opisthorchis felineus*) and gastroenteric trematodosis of ruminants (*Paramphistomum cervi*).



Infestations from adult cestodes (*Anoplocephala magna*, *Anoplocephala perfoliata*, *Avitellina centripunctata*, *Echinococcus granulosus*, *Echinococcus multilocularis*, *Dipylidium caninum*, *Dipyllobothrium latum*, *Moniezia benedeni*, *Moniezia expansa*, *Mesocestoides lineatus*, *Paranoplocephala mamillana*, *Stilesia globipunctata*, *Taenia hydatigena*, *Taenia multiceps*, *Taenia ovis*, *Taenia serialis*, *Taenia solium*, *Taenia pisiformis*, *Taenia saginata*, *Taenia taeniaeformis*) and larval stages (Hydatid cyst, Alveolar hydatid cyst, Cysticercoid, *Coenurus cerebralis*, *Coenurus serialis*, *Cysticercus bovis*, *Cysticercus cellulosae*, *Cysticercus ovis*, *Cysticercus pisiformis*, *Cysticercus tenuicollis*, Plerocercoid, *Strobilocercus fasciolaris*, Tetrathyridium in dogs, cats, horses, sheep, goats, pigs, cattle.

Nematoda infestations: Ascariidosis in pigs, horses, cattle, dogs and cats, poultry (*Anisakis* spp., *Ascaris* spp., *Ascaridia galli*, *Heterakis* spp., *Parascaris equorum*, *Toxocara* spp., *Toxascaris leonina*); Hookworms (*Ancylostoma caninum*; *Ancylostoma tubaeforme*) in dogs and cats, Uncinariidosis (*Uncinaria stenocephala*), Oxyuriasis (*Oxyuris equi*), respiratory Strongyloidosis (*Aelurostrongylus abstrusus*, *Crenosoma vulpis*, *Cystocaulus ocreatus*, *Dictyocaulus viviparus*, *Dictyocaulus filaria*, *Filaroides hirti*, *Metastrongylus* spp., *Muellerius capillaris*, *Oslerus osleri*, *Protostrongylus rufescens*, *Troglostrongylus brevior*, *Troglostrongylus subcrenatus*) in dogs, cats, sheep, goats, pigs, cattle, gastrointestinal Strongyloidosis (*Bunostomum* spp., *Chabertia* spp., *Cooperia* spp., *Haemonchus contortus*, *Nematodirus* spp., *Oesophagostomum* spp., *Ostertagia ostertagi*, *Strongyloides papillosus*, *Teladorsagia* spp., *Trichostrongylus* spp.) in ruminants, intestinal Strongyloidosis (*Cyathostomini* o 'piccoli strongili', *Oesophagostomum dentatum*, *Strongyloides* spp., *Strongylus edentatus*, *Strongylus equinus*, *Strongylus vulgaris*, *Triodontophoru* spp.) in pigs and horses, Respiratory and Urinary Capillariidosis (*Capillaria aerophila*, *Capillaria plica*, *Capillaria boehmi*), Angiostrongyloidosis (*Angiostrongylus vasorum*), Syngamosis (*Syngamus trachea*), Gnatostomosis, Spirocercosis (*Spirocerca lupi*), Trichocephalidosis (*Trichuris ovis*, *Trichuris suis*, *Trichuris vulpis*) in pigs, sheep, goats, dogs, Filariidosis (*Dirofilaria immitis*, *Dirofilaria repens*, *Acanthocheilonema reconditum*, *Onchocerca* spp.) in dogs, cats, horses, cattle, Habronemiasis *Draschia megastoma*, *Habronema muscae*, *H. microstoma*, Thelaziosis (*Thelazia callipaeda*, *Thelazia gulosa*, *Thelazia lacrymalis*, *Thelazia rhodesi*, *Thelazia skrjabini*) in dogs, cattle, horses, Trichinellosis (*Trichinella* spp.).

Arthropoda infestations: infestations caused by ticks (*Amblyomma* spp., *Boophilus* spp., *Dermacentor* spp., *Haemaphysalis* spp., *Hyalomma* spp., *Ixodes* spp., *Rhipicephalus* spp., *Ornithodoros* spp.), mites (*Cheyletiella* spp., *Chorioptes* spp., *Demodex* spp., *Notoedres cati*, *Otodectes cynotis*, *Psoroptes* spp., *Sarcoptes scabiei*, *Trombicula autumnalis*), fleas (*Ctenocephalides canis*, *Ctenocephalides felis*), lice (*Bovicola* spp., *Felicola subrostratus*, *Haematopinus* spp., *Linognathus* spp., *Trichodectes canis*), fly agents of myiasis (*Calliphora* spp., *Cochliomyia hominivorax*, *Gasterophilus* spp., *Hypoderma bovis*, *Hypoderma lineatum*, *Lucilia* spp., *Oestrus ovis*, *Przhevalskiana silenus*, *Rhinoestrus* spp., *Wohlfahrtia* spp.), seasonal pruritic dermatitis (*Culicoides* spp.). Skin lesions (*Aedes* spp., *Anopheles* spp., *Culex* spp.), horseflies (*Chrysops* spp., *Tabanus* spp.), biting flies (*Haematobia* spp., *Stomoxys calcitrans*, *Hippobosca equina*).

Pentatomid infestations: Linguatulosis (*Linguatula serrata*).



Fungus (*Microsporium* spp., *Trichophyton* spp.) and yeast (*Malassezia* spp.) infestations.

Textbooks

Taylor MA, Coop RL, Wall RL. 2010. *Parassitologia e Malattie parassitarie degli animali* (Edizione Italiana a cura di Garippa, Manfredi, Otranto), EMSI, Roma

Puccini V. 1992. *Malattie parassitarie degli animali domestici*. Edagricole, Bologna.

Ambrosi M. 1995. *Parassitologia zootecnica*. Edagricole, Bologna.

Georgi J.R., Georgi M.E. 1996. *Malattie parassitarie del cane* (edizione italiana a cura di Puccini V. e Giangaspero A.). 1996. Edagricole, Bologna.

Lecture notes



Special veterinary pathology I (7 CFU)

- Special Veterinary Pathology I
Leonardo Della Salda
- Veterinary Cyto-Histopathology
Leonardo Della Salda

Special Veterinary Pathology I

Leonardo Della Salda

Definition, aetiology, pathogenesis and description of the main gross and microscopic features, which characterize the most relevant diseases affecting the following organ systems:

- Bone Marrow, Blood Cells and the Lymphoid/Lymphatic System
- Integument (including the Udder)
- Endocrine System
- Alimentary System (including the Hepatobiliary System and the Exocrine Pancreas)
- Male and Female Reproductive Systems

Diagnostic approach and applied procedures in veterinary pathology

Veterinary Cyto-Histopathology

Leonardo Della Salda

Bioptic investigation. Processing samples for histopathological and cytological investigations.



Veterinary toxicology (4 CFU)

Michele Amorena

Programme

The programme includes the general principles in toxicology; terminology and definitions; exposure, dose and response relationship; acute and chronic exposure and effects; toxicokinetics (adsorption, distribution, metabolism and excretion); target organ toxicity; toxicological research methods; mechanisms of toxicity and mode of action; regulatory toxicity testing; laboratory animal science (D.lgs 26/2014) and alternative methods to animal testing; regulatory toxicology and health risk assessment/safety assessment.

Clinical toxicology: general symptoms and treatment of poisoning. Organic versus inorganic compounds: heavy metals (lead, mercury, arsenic, cadmium, selenium, copper and chromium), organophosphates and carbamates, organochlorines, herbicides, rodenticides, metaldehyde and fungicides. Vegetable poisons: plants and mycotoxins. Food toxicology: dioxins, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons, endocrine disruptors (PBDEs).

Practical laboratory activities: acute toxicity tests on zebrafish embryos



4th Year

Anaesthesiology and veterinary surgical medicine (5 CFU)

Cuomo Amedeo

Prerequisites

Knowledge of physiology, anatomy and pathology necessary to understand the techniques of surgery medicine and their correct application.

Understanding of physiology and pharmacology needed for the study and use of pharmacological techniques in anaesthesiology.

Objectives

- Acquisition of the basic skills, needed to approach surgical patients and to manage pain treatment, with a correct pre-operative planning.

Exam programme

Module – Surgical Medicine

General part:

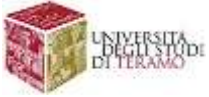
- Surgical instruments and management of the operating theatre. Asepsis and antisepsis. Halsted principles, and principles of the biomechanics of hard and soft tissues. Diuresis and exeresis. Hemostasis. Synthesis, techniques and material. Drainages.

Special part:

- Treatment of wounds. Principles of plastic surgery, grafts and flaps. Herniorrhaphy. Approaches towards the large bodily cavities, and the most common surgeries on organs contained in them. Basic surgical interventions of the eye, ear, hollow structures and skeleton.

Module – Surgical Medicine

- Terminology and definitions
- Surgical stress response and pain, and the prevention and treatment of these phenomena
- Pharmacology of the principle CNS depressants
 - Parenteral and respiratory administration of anesthetics and their kinetics
 - Operation and use of anesthesia equipment
- Preoperative evaluation and intra-operative monitoring of the patient
- Anesthetic protocols and treatment of pain in the various areas of veterinary medicine
- Complications in anaesthesiology



Recommended textbooks

- “Monographies” edited by Prof. A. Cuomo
- A textbook of Small Animal Surgery-Slatter-Saunders – various editions
- Slatter D.H., *Trattato di chirurgia dei piccoli animali* SBM Noceto (Pr) 1990.
- Bojrab, *Tecniche attuali di chirurgia nei piccoli animali*, UTET Torino 2003
- Muttini, Berardinelli, *Medicina operatoria veterinaria*, Delfino ed.
- Lumb & Jones, *Veterinary Anesthesia*, J. C. Thurman, W. J. Tranquille, and C. J. Benson. Baltimore: Williams & Wilkins, 1996



Diagnostic imaging and laboratory (7 CFU)

- Veterinary diagnostic laboratory
Morena Di Tommaso
- Imaging diagnostic, radiology and veterinary endoscopy
Massimo Vignoli
- Preliminary bases in diagnostic laboratory
Roberto Giacomini Stuffer

Veterinary diagnostic laboratory

Morena Di Tommaso

Complete Blood Count: erythrocyte, leukocyte and platelet disorders.

Haemostatic Profile: diagnostic tests for the evaluation of the most common haemostatic abnormalities.

Serum Biochemistry Profile: main ions, enzymes and serum metabolites for the evaluation of damage and/or functionality of different organs and systems.

Plasma Protein Disorders

Urinalysis: physical, chemical and sediment analysis. Urine Protein: Urine Creatinine Ratio.

Evaluation of Body Cavity Effusions: abdominal, pleural, and pericardial fluid accumulation.

Endocrine Profile: tests for the evaluation of the most common disorders of the thyroid, adrenal gland and pancreas.

Transfusion Medicine: blood groups in dogs and cats; blood crossmatching test.

Reference books

- Lecture Slides

- Willard M.D., Tvedten H.: *Small animal clinical diagnosis by laboratory methods*, 5th edition, 2012, Saunders, Elsevier, USA.

- Willard M.D., Tvedten H.: *Diagnostica di laboratorio nei piccoli animali*, 4a edizione, 2005, Elsevier Italia Srl, Milano

- Feldman B.F., Zinkl J.G., Jain N.C.: *Schalm's Veterinary Hematology*, 6th edition, 2010, Lippincott Williams & Wilkins, Philadelphia

- Thrall M.A.: *Veterinary hematology and clinical chemistry*, second edition, 2012, Lippincott Williams & Wilkins, Philadelphia

- Villiers E., Blackwood L.: *Gli Esami Di Laboratorio. Indicazione Esecuzione Interpretazione - Cane e Gatto*, 2a ed. 2006, UTET S.p.a. Divisione Scienze Mediche, Torino

- Meyer D.J., Harvey J.W.: *Veterinary Laboratory Medicine. Interpretation and diagnosis*, 3rd edition, 2004, Elsevier.

- Meyer D.J., Harvey J.W.: *Medicina di laboratorio veterinaria. Interpretazione e diagnosi*, 3a ed., 2007, Antonio Delfino Editore

- Day M., Mackin A., Littlewood J.: *Manual of Canine and Feline Haematology and Transfusion Medicine*, first edition, 2000, British Small Animal Veterinary Association, Gloucester



- Day M., Mackin A., Littlewood J., Lubas G.: *Ematologia e Medicina Trasfusionale del Cane e del Gatto*, 1° ed. 2004, UTET, Torino



Imaging diagnostic, radiology and veterinary endoscopy

Massimo Vignoli

The examination of Diagnostic Imaging includes the following topics:

1. Radiographic technique and radioprotection
2. Radiographic anatomy of thorax
3. Radiology of thoracic wall, diaphragm and pleura, mediastinum, trachea, esophagus, heart and large vessels
4. Radiology of lungs
5. Radiology of abdominal and retroperitoneal masses; radiology of liver, spleen and pancreas
6. Radiology of urinary, genital and gastroenteric apparatus
7. Radiology of axial and appendicular skeleton: developmental and metabolic, infectious and neoplastic diseases
8. Overview of abdominal ultrasound

Preliminary bases in diagnostic laboratory

Roberto Giacomini Stuffer

Objectives

Teaching students the distinctive characteristics of a diagnostic laboratory and giving them understanding of the basic methodologies of clinical biochemistry. This module also aims at providing the basic techniques of clinic molecular biology.

Programme

Diagnostic laboratory and quality control

Specimen, collection and biological material storage. Analytical variability and measurement errors. Control methods used in a diagnostic laboratory. Biological variability and reference values.

Clinical Biochemistry

Spectrophotometric measurements for the determination of analytes. Immunochemical methods for the measurement of antigens. Enzyme assays of biological fluids. Proteomic applied to the diagnostic.

Clinical Molecular Biology

Restriction enzymes. The PCR reaction in clinical diagnostic. Real-Time PCR. Prevention of contamination in a molecular biology laboratory.

Assessment

Written or oral test.

Office hours: every day by appointment.



Recommended textbooks:

- *Metodologie di base per la biochimica e la biotecnologia*, A.J. Ninfa, D.P. Ballou, Ed. Zanichelli.
- *Biotecnologia molecolare*, R.G. Glick, J.J. Pasternak, Ed. Zanichelli.
- Lecture notes.



Inspection and Control of Animal-Derived Food: Primary Productions (8 CFU)

- Inspection and Control of Animal-Derived Food: Primary Productions
Alberto Vergara
- Hygiene and Technology of Animal Productions
Luca M. Pennis

Inspection and Control of Animal-Derived Food: Primary Productions
Alberto Vergara

Hygiene and control of animal-derived food in an EU perspective:

Regulation (EC) No 178/2002 of the European Parliament and of the Council

Regulation (EC) No 852/2004 of the European Parliament and of the Council

Regulation (EC) No 853/2004 of the European Parliament and of the Council

Regulation (EC) No 854/2004 of the European Parliament and of the Council

Regulation (EC) No 882/2004 of the European Parliament and of the Council

Regulation (EC) No 625/2017 of the European Parliament and of the Council

Hazard Analysis and Critical Control Point (HACCP) principles

The application of hazard analysis and critical control point (HACCP) principles to primary productions

Official controls performed by the competent authority: audit, inspection, monitoring, surveillance, sampling for analysis

Inspection and control of fresh meat

Tasks of an official veterinarian: auditing and inspection tasks (food chain information, ante-mortem inspection, animal welfare, post-mortem inspection, specific risk material and other animal by-products, laboratory testing)

Inspection and control of fresh meat from domestic ungulates, poultry, lagomorphs, wild game in slaughterhouses, game handling establishments and cutting plants placing fresh meat on the market.

Identification mark and health mark

Inspection and control of meat preparations

Inspection and control of fishery products

Inspection and control of eggs

Inspection and control of honey

Inspection and control of frogs' legs and snails

Preserving processes of primary production: chilling, freezing or quick-freezing, vacuum-wrapped products or wrapped in a controlled atmosphere.

Hygiene and Technology of Animal Productions



Luca M. Pennis

Objectives: This course aims at ensuring theoretical knowledge and practical skills, necessary to acquire veterinary skills to monitor all phases of food-storage and foodstuff processing and delivering to consumer; as well as at ensuring food safety and quality, at evaluating risk for human health.

Objectives: 1. Knowing EU legislation on food safety during all stages. 2. knowing technologies of animal slaughtering and being able to ensure animal welfare during slaughtering. 3. Knowing the chemical and morphological composition of different food products, their production technologies, methods of preservation, requirements of labelling, packaging and hygiene. 4. Being able to make antemortem and postmortem inspection, to evaluate the results and to use them in practice. 5. knowing the principles of self-control systems on the basis of risk analysis and control methods of food-storage and foodstuffs.

Teaching Unit 1

Introductory notions (including general principles of food quality). Sensory quality of food. Quality of presentation. General concepts of quality management systems in food industry. Principles of quality management system.

The slaughter-house: placing, equipment, use. Welfare during live animals' transportation. Reception of animals in slaughterhouses and their preparation for slaughter. Ante-mortem **control and control of the carcasses' flow. Slaughtering technology: slaughtering technological** stages. Techniques for stunning and bleeding, techniques for skinning animals and cutting **units'** evisceration technique. Inspection and control technique of organs in slaughtered animals. Frequent lesions. Sanctions. Biochemical processes in meat after slaughter and their practical relevance. Wild game technology.

Teaching Unit 2

Anatomical foundations, main components and nutritional value of fishery products (fishes, cephalopods, crustaceans and bivalve molluscs). Hygiene in the commercialization of bivalve molluscs. Post-mortem modifications of fishes. Determination of the degree of freshness. Application of Quality Index Method. Evaluation of chemical indicators of freshness. Main risks associated with fish consumption (parasites, microbes and histamine). Hygiene and inspection of crustaceans and cephalopods.



Obstetrics, Physiopathology of Animal Reproduction and Artificial Insemination Techniques (7 CFU)

- Obstetrics and Artificial Insemination Techniques
Augusto Carluccio
- Physiopathology of animal reproduction
Domenico Robbe

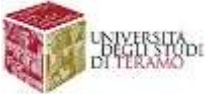
Obstetrics and Artificial Insemination Techniques Augusto Carluccio

1. PART ONE: Normal Oestrous Cycle
 - Endogenous and exogenous control of ovarian cyclicity
2. PART TWO: Pregnancy and Parturition
 - Development of the conceptus;
 - Pregnancy and its diagnosis;
 - Parturition and the care of parturient animals;
 - puerperium and care of the newborn.
3. PART FOUR: Operative Interventions
 -
4. PART FIVE: Infertility
5. PART SIX: Male Animals
 - Normal reproduction in male animals;
 - Fertility and infertility in male animals;
 - Artificial insemination.
6. PART SEVEN: Exotic Species
7. PART EIGHT: Embryo Transfer
 - Embryo transfer in Large Domestic Animals.

Physiopathology of animal reproduction Domenico Robbe



- Pregnancy Diseases: molar pregnancy, uterus inversion and prolapse, uterus torsion, hysterocele, uterus rupture, pregnancy toxicities in sheep, pregnancy termination, embryo resorption, abortion, foetus maceration and mummification;
- Delivery Diseases: rectum-vaginal dystocia, uterus, perineum and cervix lacerations.
- Puerperium Diseases: uterus inversion and prolapse, placental retention, puerperal collapse, eclampsia, ketosis, metritis, ovarian cysts.
- Diestrus Diseases: pyometra in bitches, pseudopregnancy in bitches.



Semeiotics and General Surgical Pathology (12 CFU)

- Semeiotics and general surgical pathology (referring to large animals)
Lucio Petrizzi
- Semeiotics and general surgical pathology (referring to small animals)
Amedeo Cuomo
- Veterinary Anatomy
Augusto Scapolo

Semeiotics and general surgical pathology (referring to large animals)

Lucio Petrizzi

General considerations for surgery of equine patients. Preparation of equine patients for general surgery. Peri- and post-operative management of equine surgical patients. Complications of general surgery in equine patients. Castration of equine males. Ovariectomy in mares. Diagnosis and management of cryptorchidism in horses. Urolithiasis: diagnosis and surgical treatment in equine patients. Surgical conditions affecting equine penis: phallectomy. Semiology and pathology of equine acute abdomen. Diagnosis of equine colic and decision for treatment. Pathophysiology of equine upper respiratory disorders. Causes of respiratory noise in horses. Diagnosis and treatment of equine upper respiratory disorders. Functional and anatomic stenosis of upper airways in horses: etiopathogenesis, diagnosis and treatment.

Semeiotics and general surgical pathology (referring to small animals)

Amedeo Cuomo

Introduction. Death, necrosis and gangrene. Traumata and traumatic lesions. Compressions and contusions. Ruptures and lacerations. Wounds: classification. Anatomical dissection of the equine distal limb. Fractures: definition. Asepsis and antisepsis. The surgical unit: space organization. The surgical unit: space organization and surgeon preparation. General physical examination. Physical examination of the respiratory system. General physical examination of horses. Physical examination of the respiratory system. Fractures: classification. Inflammation. Acute and chronic inflammation. Evolution of the inflammatory process. Regeneration and scarring. Scar and wound healing. First and second intention healing. Bone tissue healing. Physical examination of the gastrointestinal system. Physical examination of the locomotor system. Physical examination of the gastrointestinal system. Physical examination of the locomotor system. Disturbance of soft tissue healing. Disturbance of bone tissue healing. Ulcers. Fistulas. Disorders of the physis. **S.Harris's fractures. Thrombosis. Embolism and metastasis. Tumours. Atresy, stenosis and occlusions.** Adherences, adhesions and anchyloses. Cysts. Contractures and flexural deformities. Ectasy and pathologic emissions. Infiltrations. Retentions. Cryptorchidism. Ectopy and heterotopy. Paratopies. Lussations. Dysplasia. Pathogenesis of OA.



This course unit focuses on certain aspects of semeiotics necessary for the examination of the nervous system, the musculoskeletal system, and the sense organs (emphasizing vision and hearing). In addition, the procedure for localizing functional problems, differential diagnosis, and selecting the most appropriate collateral diagnostic examinations will be studied.

As far as surgical diseases of companion animals are concerned, this course unit deals with the differential diagnosis of diseases of the spinal cord and vertebral column (intervertebral disks, spinal trauma); differential diagnosis of brain diseases (head trauma and epilepsy). In addition, physiopathology and diagnosis of the main musculoskeletal abnormalities will be treated, with particular attention to fractures, dysplasia and the pathogenesis of arthrosis. Finally, the main ophthalmic diseases and related diagnostics will be examined, as well as the diseases of the external, middle and inner ear.

Veterinary Anatomy

Augusto Scapolo

Topics

Course: Semeiotics and Veterinary Surgical Pathology

Objectives of the module

The first general objective is to look at the body conformation – in particular the regional anatomy of fore and hind limbs in horses and dogs.

Detailed module description

General Osteology, Arthrology (classification of joints, different synovial joints, structure of synovial joints and movements permitted, description of synovial bursa and synovial sheath) and Myology.

Study of thoracic vertebrae, ribs and sternum of dogs and horses.

Fore limbs: study of bones of fore limbs of dogs and differences in horses. Study of equine hooves. Study of joints, ligaments, stay apparatus, muscles, major blood vessels, nerves, veins of fore limbs. Sites for radial, median, ulnar and volar nerve blocks.

Demonstration of radiographs of normal bones of fore limbs.

Hind limbs and pelvis: study of bones of hind limbs and pelvis of dogs and horses. Study of joints, ligaments, muscles, major blood vessels and nerves of hind limbs, pelvis and tail region.

Sites for tibial, peroneal and plantar nerve blocks.

Demonstration of radiographs of normal bones of hind limbs.

The second general objective is to connect neuroanatomical knowledge with neurological examination of pets. Students will learn which structures of the central and peripheral nervous system are responsible for reflexes used in clinical examination; appreciate the clinical signs that accompany dysfunctions of the twelve cranial nerves; learn the difference between lower and upper motor neuron signs. Thorough knowledge is the basis for neurolocalisation.

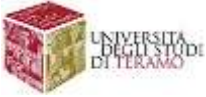
Detailed module description

Reflex arc and reflex action, varieties of reflex arc, types of reflexes (patellar reflex, the withdrawal reflex, the perineal reflex, the cutaneous trunci reflex). Cranial nerves anatomy and



description of reflexes used in its function assessment (the menace response, the pupillary light response, the palpebral reflex and the corneal reflex).

Practical part on cadavers: regional anatomy of limbs.



Semeiotics and Veterinary Medical Pathology (8 CFU)

- Veterinary Medical Semeiotics
Andrea Boari
- Veterinary medical pathology
Giovanni Aste

Veterinary Medical Semeiotics
Andrea Boari

Objectives

In this course unit undergraduate students will acquire the basic skills for clinical observation, interviewing clients, taking an anamnesis and performing physical examination of small animals, horses and bovine patients.

Through a problem-oriented teaching method, students will learn to take an exhaustive anamnesis, examine patients in details and collect as many data as possible. Then they will learn to identify the potential causes of any abnormality found during clinical examination. The development of a problem list is based on understanding the potential mechanistic causes of whatever problem may have occurred.

The fundamentals of a complete patient examination – i.e. general inspection, particular distant examination of body regions and close physical examination – are provided to every student. The sequence in examining body systems or regions ends with a neurological examination

During practice exercises students are encouraged to enhance the individual skills of observation by means of palpation, percussion, auscultation, and smelling both in small and large animals.

At the end of this course unit, any student should be able to:

- carry out an accurate and detailed anamnesis in the different contexts where it may happen to a veterinary surgeon to operate (in a stable, a breeding farm, a clinic, a veterinary hospital), thus acquiring specific communicative skills as well;
- carry out an adequate and thorough clinical examination of individuals belonging to the main domestic species (i.e. bovine and equine livestock, sheep, swine, dogs and cats) by means of a remote and close examination, palpation, percussion, auscultation of the various organs and apparatus following the modalities and the sequence established by the School of Veterinary Medicine, University of Bologna;
- identify and diagnose the clinical sign or symptom in a certain clinical case;
- identify, list and describe the different pathological processes responsible for the given symptom that has been referred to in the anamnesis or the given sign reported during direct clinical examination;



- develop a list of problems (differential diagnoses) based on the knowledge of all the possible aetiopathogenetic mechanisms that may be the cause of the problem;
- increasingly enhance and develop the individual skills of observation by means of palpation, percussion, auscultation, and smelling both in small and large animals;
- learn to use the correct medical veterinary terminology even if the ability of explaining difficult terms and/or concepts in simple and clear words needs to be always developed – whatever it may be the context where a veterinary surgeon needs to operate (farm animals vs companion animals) or the person with whom he/she may interact (an owner, a breeder, a foster owner, a colleague).

Veterinary medical pathology

Giovanni Aste

Introduction

Aims of lectures, teaching modality, examination modality, recommended textbooks and bibliography. Database on the web (Pub Med, Science direct, Google scholar), major concepts of Evidence-Based Veterinary Medicine.

Teaching Activity 1 - Respiratory Diseases

Clinical and diagnostic evaluation of the respiratory tract

Diseases of trachea and small airways

Diseases of the pulmonary parenchyma

Clinical cases and practical applications

Teaching Activity 2- Kidney Diseases

Clinical approach and laboratory evaluation of kidney diseases

Kidney diseases: urinary and plasmatic markers

Acute kidney injuries and acute kidney failure

Chronic kidney diseases

Disease of the lower urinary tract

Teaching Activity 3- Heart Diseases

Myocardial diseases, pericardial diseases, endocardial diseases

Pathophysiology of heart failure

Cardiac Arrhythmias

Teaching Activity 4- Gastrointestinal Diseases

Clinical and Laboratory evaluation of the Gastrointestinal tract. The concept of microbiota

The disorders of oral and salivary glands. Diseases of the esophagus

Diseases of the stomach

Diseases of the small intestine

Diseases of the large intestine and rectum



Diseases of the pancreas
Hepatobiliary diseases

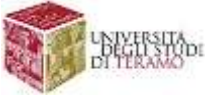
Teaching Activity 5- Endocrine Diseases

Diseases of the hypophysis
Hyperadrenocorticism
Hypoadrenocorticism
Diseases of the thyroid
Diabetes mellitus

Practical Lab

Clinical cases and practical applications

The module of Veterinary Medical Pathology includes specific seminars on Emergency and Critical Care, Neurology, Equine Internal Medicine, Bovine Internal Medicine, Oncology



Special Animal Breeding (11 CFU)

- Technology and hygiene in breeding farms
Giorgio Vignola
- Poultry and rabbit farming
Giuseppe Martino

Technology and hygiene in breeding farms

Giorgio Vignola

Main objectives

This module provides elements improving knowledge of the management of the main structural and hygienic-environmental factors able to influence the health, the well-being, the correct life conditions and the productions of farmed animals. In particular, these factors will be analysed in swine, dairy cattle, beef cattle and dogs. Emphasis will be given to aspects related to the main health indicators in order to set a diagnostic path to ensure a correct productive performance. Aspects related to the different productive phases studied in details will concern: structural aspects; requirements in terms of environmental quality (temperature, relative humidity, air speed); building lighting; feeding management. Needs related to animal welfare and the application of relevant regulations will be emphasized. Biosecurity and hygiene management: cleaning, disinfection. Finally, critical assessment elements will be provided in relation to intensive production compared to eco-compatible and organic farming systems.

Programme

- **Pig farming: production costs and production rates; types, sectors and phases of breeding: gilt management; dry sow management; farrowing and lactation; post-weaning and fattening management; notes on the quality of Italian pig production.**
- **Dairy cattle: cattle breeding situation in Italy and in the EU countries; dairy cattle housing techniques: types of stables; milking parlours; husbandry from veal to the milking cow.**
- **Management of beef-cows (cow-calf line): housing techniques; winter and grazing; management of reproduction and feed management of cows; calf breeding.**
- **Breeding of beef cattle: choice of calves; farming and equipment; feed and production.**
- **Kennels and dog breeding: housing dogs; breeding of puppies from birth to weaning; elements of technical-economic management.**

Poultry and rabbit farming

Giuseppe Martino

Production and consumption of poultry in Italy. Commercial organization of poultry on a national scale. Egg choice and conservation. Techniques and hygiene of artificial incubation.



Poultry barns: general and construction characteristics. Management of environmental conditions. Lighting and ventilation. Farm equipment. Bedding types. Feeding techniques. Meat poultry breeding. Broilers. Laying hens. Composition and nutritional value of poultry products. Quality of poultry. Egg quality. Management of turkeys. Management of rabbits.



Special veterinary pathology II and Forensic Veterinary Medicine (8 CFU)

- Special Veterinary Pathology II
- Forensic Veterinary Medicine

Leonardo Della Salda

Special Veterinary Pathology II

Leonardo della Salda

Definition, aetiology, pathogenesis and description of the main gross and microscopic features, characterizing the most relevant diseases that affect the following organ systems:

- respiratory system;
- urinary system;
- cardiovascular system;
- skeletal muscle;
- bones, joints, tendons and ligaments.

Forensic Veterinary Medicine

Leonardo Della Salda

Definition, aims and limits of necropsy. Thanatology. Forensic veterinary medicine: the medical-legal expertise.

Equipment. Precautions to be taken before, during and after necropsy and related regulations. Necropsies of dogs, cats, pigs, cattle, sheep and goats, horses, rabbits and laboratory animals in the necropsy room. Management of necropsied animals and related regulations.

Animal identification and history. Accompanying forms. Preparation, external inspection, skinning, examination of subcutaneous tissues. Opening and inspection of the following anatomical districts: abdominal cavity, thoracic cavity, pelvis, head, nasal cavities and sinuses, spinal canal, neck and medullary cavity of long bones. Anatomical features of animal species and breeds.

Extraction of viscera and examination of each single organ. Description, pathological interpretation and epicrisis. Report of the necropsy.

Laboratory investigations. Collecting and sending samples for histological, cytological, microbiological and toxicological tests. Medical legal report.



5TH Year

Inspection and Control of Processed Products of Animal Origin (9 CFU)

- Inspection of Animal Food Products: Processed Products
Alberto Vergara
- Hygiene and technology of processed products
Domenico Paludi
- Epidemic emergency treatment
Giovanni Di Paolo
- Management of Non-epidemic Emergencies
Alberto Vergara

Inspection of Animal Food Products: Processed Products
Alberto Vergara

Teaching Unit 1

Introduction to the Course Unit

Food spoilage: concepts of spoilage association and specific spoilage organisms.

Food as a dynamic system for microbial growth: factors influencing the growth of microorganisms.

Factors influencing the growth of microorganisms in food: pH, activity water, oxygen and temperature.

The application of factors influencing microbial growth in food preservation: chemical, physical and biological methods of food preservation.

Inspection and control of meat products processed by temperature: educational visit in a typical **industry producing the "olive all'ascolana"**.

Inspection and control of meat products processed by salting: educational visit in an industry producing ham.

Inspection and control of meat products processed by fermentation: educational visit in an industry producing raw fermented sausages.

Teaching Unit 2

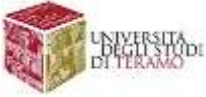
Food preservation by high temperature: heat treatments of raw milk

Food preservation by high temperature in the catering industry: food poisoning by *Clostridium perfringens*

Processed fishery products: stockfish; dried salted cod; marinated anchovies; smoked salmon; canned tuna.

Food preservation by High Pressure Processing (HPP).

The Commission Regulation (EC) No 2073/2005 on the microbiological criteria for foodstuffs.



Inspection and control of milk and dairy products: educational visit in an industry producing heat-treated milk and dairy products.

Inspection and control of processed fishery products: educational visit in an industry producing stockfish and dried salted cod preserved by HPP.

Educational visit in a food retail and wholesale distribution center: tasks of the competent authority and official controls.

Hygiene and technology of processed products

Domenico Paludi

- Microbial contamination in food industries (primary, secondary, tertiary and quaternary contaminations).
- Research and identification of microorganisms present in air, water, on working surfaces and ISO standards of reference.
- Hygiene of equipment, personnel and processing environments.
- Proper sanitation procedures in food industries.
- Main features of disinfectants and detergents.
- Microbial biofilms and problems in processing environments (surface conditioning, cell adhesion, biofilm formation, maturation, biofilm detachment and dispersion).
- Generalities on microorganisms (morphological features, cultural features, colorations, metabolic properties, factors influencing growth, biochemical identification, use of optical, electronic microscopy and sterilization).
- Antibiotics and classification by type of action.
- Determination of sensitivity to antimicrobial agents, MIC and MBC.
- Methods for the assessment of microbial contamination (assessment of contamination at control points, microbial load, microbiological criteria and sampling plan).
- Microbiological analysis of foods: research, identification and ISO standards of reference.
- Main microorganisms responsible for food diseases (*Escherichia coli*, *Bacillus cereus*, *Staphylococcus aureus*, *Listeria monocytogenes*, *Salmonella*, *Campylobacter*, *Vibrio*).
- Audit and management system certification: verification design, document analysis and obtained results.

Laboratory Practical Activities:

- Preparation of culture media, growth and bacterial identification.
- Microbiological analysis of surfaces: ISO 18593.
- Analysis of microorganisms present in air and water.
- Determination and microbiological identification from a food matrix.
- Sensitivity to antimicrobial agents by means of Kirby-Bauer, Broth dilution, E-Test and automated systems.
- Biochemical and molecular identification of the main pathogenic bacteria.

Epidemic emergency treatment



Giovanni Di Paolo

Prerequisites

Understanding of the epidemiological basis of the main infectious diseases.

Objectives

Providing students with fundamental knowledge, enabling the recognition, management and resolution of the veterinary epidemiological emergencies included in this programme.

Exam programme

Infectious diseases included in the ex "A list" of the OIE.

Recognition, reporting, suspicion, confirmation. Evaluation, entrance, management, exit and resolution of epidemiological emergencies related to one or more of the following infectious diseases:

African Horse Sickness, Anthrax, Avian Influenza (HPAI in poultry, captive birds and wild birds and LPAI in poultry and captive birds), Bluetongue Disease, Bovine Spongiform Encephalitis, Classical Swine Fever, Contagious Bovine Pleuropneumonia, Dourine, Eastern Equine Encephalitis, Japanese Encephalitis, Venezuelan Equine Encephalomyelitis, West Nile Disease, Equine Infectious Anemia, Foot and Mouth Disease, Glanders, Lumpy Skin Disease, Newcastle Disease, Peste Des Petits Ruminants, Rabies, Rift Valley Fever, Rinderpest, Sheep Pox, infestations of the Small Hive Beetle (*Aethina tumida*), Swine Vesicular Disease, *Tropilaelaps* infestation of honey bees, Vesicular Stomatitis, Bovine Brucellosis, Bovine Tuberculosis, Bovine Enzootic Leukosis, Ovine and Caprine Brucellosis.

Recommended textbooks

Lecture notes.

Management of Non-epidemic Emergencies

Alberto Vergara

Food Emergencies: definition and importance

"Food Law" at Community level: ordinary controls of food safety

Risk analysis, traceability, precautionary principles, food safety requirements (unsafe food: injurious to health and unfit for human consumption), responsibilities for food: food business operators and role of competent authorities.

The "Food Law" at National level: ordinary controls of food safety.

Food crimes: the Penal Code and the Article 5 of the Law no 283/62

The "Food Law" at Community level: the Rapid Alert System

The "Food Law" at Community level: Emergencies

The "Food Law" at Community level: Crisis Management



Veterinary Clinical Medicine, Therapy and Legal Medicine (11 CFU)

- Small animal medical clinic and therapy
Andrea Boari
- Veterinary clinical medicine and veterinary medical therapy (referring to large animals)
Alessia Luciani
- Veterinary Legal Medicine, Veterinary Legislation, Animal Protection and Deontology
Tonino Talone
- Behavioral Medicine
Raimondo Colangeli

Small animal medical clinic and therapy

Andrea Boari

This is a small animal internal medicine and therapeutic interactive/discussion course which involves homework, pop tests, scheduled tests and solving clinical cases in small animal internal medicine. The scope of the course may include any medical problem that occurs in dogs and cats but is focused on the main syndromes. The specific content of the course typically varies from year to year depending of the patients referred to the VTH during the class time. Part of the clinical cases come from hospitalized animals. Students learn how to approach a clinical case starting from the correct interview of the owner, going through physical examination and correctly recommending the diagnostic and the therapeutic steps.

Students will learn to methodically solve clinical problems and recommend the best therapeutic approach. They will develop skills necessary for collection of clinical data and will develop clinical reasoning and problem-solving skills.

In order to pass this course, students must demonstrate the ability to work both independently and in a team to solve diagnostic and therapeutic problems and/or take care to a clinical case and/or answer clinically relevant questions with or without available reference material within a time frame defined by the instructor.

Course Objectives:

1) The students will learn how to solve clinical problems logically and methodically, as opposed to using memory and "pattern recognition". This methodical approach includes a) defining problems at their highest possible level, b) determining the possible rule outs (i.e., differential diagnoses), c) determining which of the possible rule in are most likely based upon the available data, and d) determining the optimal diagnostic and/or therapeutic plan based upon the assessment.

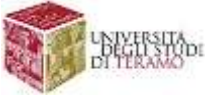


2) The students will learn to use existing texts and/or library facilities and/or web site to solve clinical problems.

3) The students will come to understand various clinical problems so that they a) can readily distinguish between problems that mimic one another, b) know and understand the categories of diseases that produce a particular problem and how to distinguish between these categories, c) know the specific diseases that cause each category mentioned in 3b, and d) know and understand the tests needed to distinguish between the various diseases. C) choose the right treatment based on the presumptive diagnosis and/or to correct or control severe clinical signs.

Program

- 1) Opening lesson: the course will start with a presentation of the Professor and details about the course structure including aims, lesson plans, the exam program, expected learning results, evaluation methods and recommended texts.
- 2) The syndrome of inappropriate urination: a presentation of a clinical case will be used to guide the student to understand the etiological and pathogenetic causes of the syndrome and the differential diagnosis between dysuria, incontinence and PU/PD. The correct interpretation of results, recognizing signs, diagnosis and a brief mention of treatment plans will be emphasized.
- 3) Approaching vomit and acute diarrhea: Etiology, pathogenesis and differential diagnosis. How to differentiate a stable patient from a critical one. How to differentiate gastrointestinal and non-gastrointestinal causes. Eventual collateral examinations in cases of vomit and/or acute diarrhea and which ones to use in the various clinical cases presented. Therapeutic approaches: fluid therapy, anthelmintic and gastroprotective drugs and antibiotics used in the gastrointestinal tract.
- 4) Approaching the patient with chronic gastrointestinal signs: Etiology, pathogenesis and differential diagnosis. Differentiation between primary gastrointestinal causes and extra gastrointestinal ones. Differentiation between diarrhea of the small and large intestines. In cases of malabsorption, the subdivision of causes associated with intestinal protein losing and those not associated with intestinal protein losing. Approaching maldigestion (TLI) and malabsorption (folate, cobalamin). The diagnostic and therapeutic approach towards chronic enteropathy, using a sequence of dietary trials (elimination diet), antiparasitic drugs, antibiotics, and the use of immunosuppressive drugs after intestinal biopsies. The diagnosis of lymphoma in the dog and cat.
- 5) Icteric syndrome: Etiology, pathogenesis and differential diagnosis of the syndrome. How to differentiate between pre-hepatic icterus and hepatic, and post-hepatic icterus. How to differentiate between hepatic, and post-hepatic icterus. Differential diagnosis of the three forms of icterus.
- 6) Approaching the patient with pallor of mucous membranes: The distinction between anemia and hypoperfusion. Approaching the anemic patient including etiology and pathogenesis and the differential diagnostic approach of the anemic syndrome.



Regenerative anemia vs non regenerative anemia. Differentiation between hemorrhagic and hemolytic anemia.

- 7) Approaching the patient with cardiac insufficiency Etiology, pathogenesis and differential diagnosis of the syndrome. Causes of cardiac insufficiency and characterizing signs in terms of differential diagnosis. Possible collateral examinations applicable in cases of cardiac insufficiency and the choice of those applicable in the specific case. The interpretation of results, verification of the phenomenon, appropriate diagnosis and therapy.
- 8) Approaching the patient with acute uremic syndrome: Etiology, pathogenesis and differential diagnosis of the syndrome. Causes of acute renal insufficiency, and characterizing features for differential diagnosis. Eventual collateral examinations applicable in such cases and the choice of which ones to use in a specific clinical case. Interpreting results, diagnosis, and the recommended therapeutic approach.
- 9) Approaching the patient with chronic renal insufficiency: Etiology, pathogenesis and differential diagnosis. Causes of chronic renal insufficiency and characterizing features for differential diagnosis. Eventual collateral examinations applicable in such cases and the choice of which ones to use in a specific clinical case. Interpreting results, diagnosis, and the recommended therapeutic approach. The IRIS classification system.
- 10) Approaching the patient with generalized weakness: Etiology, pathogenesis and differential diagnosis. Causes of generalized weakness and characterizing features for differential diagnosis. Eventual collateral examinations applicable in such cases and the choice of which ones to use in a specific clinical case. Interpreting results, diagnosis, and the recommended therapeutic approach.
- 11) Approaching the patient with respiratory syndromes: Etiology, pathogenesis and differential diagnosis. Causes of the respiratory syndrome and characterizing features for differential diagnosis. Differentiating between respiratory and cardiac origin. Eventual collateral examinations applicable in such cases and the choice of which ones to use in a specific clinical case. Interpreting results, diagnosis, and the recommended therapeutic approach.
- 12) Approaching the patient with hypercalcemia
- 13) Approaching the patient with hypoglycemia
- 14) Approaching the patient with hypoalbuminemia
- 15) Approaching the patient with PU/PD, polyphagia, symmetrical bilateral alopecia and an increase of abdominal volume.

Practical lessons

Practical lessons take place with small groups of students with a tutor. They consist of the students performing a clinical examination of animals present in the Veterinary Teaching Hospital, including differential diagnosis through the planning, use and interpretation of appropriate collateral examinations. The students will formulate a diagnosis, verifying that all results are justified, and prescribe an appropriate treatment plan.



The aim is for each student to acquire a) the capacity to perform and register a clinical examination b) the capacity to formulate a diagnosis and prescribe a treatment plan based on the specific syndrome diagnosed in the patient.

The case log is that of the Veterinary Teaching Hospital, and mainly includes syndromes treated during frontal lessons.

The homework consists in the resolution of a clinical case, structured as follows: anamnesis, **owner's main concern, findings of the physical examination, results of complete blood and urine work up.** The student will be encouraged to use textbooks, bibliography and the internet as references, but will be expected to individually resolve the clinical case within the timeframe indicated. The student is expected to use the anamnesis, direct physical examination, and collateral examinations to identify the main problem/s, present them as a list, describe the differential diagnosis and which collateral examinations should be recommended to rule in/rule out each diagnosis.

Veterinary clinical medicine and veterinary medical therapy (referring to large animals)

Alessia Luciani

This is an internal medicine and therapeutic interactive/discussion course which involves pop tests, scheduled tests and the solving of clinical cases of internal medicine. The objectives of the course include any medical problem that may occur in horses, and cattle. The specific content of the course typically varies yearly. A part of the clinical cases comes from hospitalized animals, so that students learn how to approach a clinical case starting from the correct interview, going through physical examination and, then, through optimal diagnostic and therapeutic steps.

Course Objectives:

Students will learn to methodically solve clinical problems. They will develop the skills necessary to collect clinical data and will develop clinical reasoning and problem-solving skills. In order to pass this course, students need to be able to work independently, solve problems and/or take care of clinical cases and/or answer to clinically relevant questions with or without reference material within a time frame defined by the supervisor.



Veterinary Legal Medicine, Veterinary Legislation, Animal Protection and Deontology

Tonino Talone

Introduction to the subject, notes on the functioning of the European Union. Regulations, directives, decisions, opinions and recommendations. National Health Service, ISS, CSS UVAC and PIF. The law for prevention of stray dogs (Law 281/91), the Abruzzo region law (Law No. 47/2013). The legislation on drugs. Veterinary prescriptions. Modifications to the criminal code for crimes against animals, law 189/2004, law 201/2010. Animal experimentation. The legislation on veterinary drugs. D.P.R.309/90. Legislation on commercial animal transport (Regulation No 1/2005). Legislation on animal transport not for commercial purposes (Regulation No 576/2013, Regulation 577/2013). Civil code and work contract for professional services. Informed consent. Code of ethics.

Behavioral Medicine

Raimondo Colangeli

Introduction to the Behavioral Medicine course 1h

Behavioral development of the puppy and kitten 2 h

Intraspecific and interspecific communication of the dog 2 h

Approach to the visiting patient and hospitalization 1 h

The behavioral visit 1 h

General psychopathology: cognitive and emotional disorders 3 h

Behavioral semiology 2 h

Psychopharmacology 2h

Attachment and attachment disorders: Sensory deprivation syndrome and Hypersensitivity-Hyperactivity syndrome; the behavioral pathologies linked to pathological aging 3 h

The concept of social group. Competitive syndrome of relationship 4 h

Learning and cognitive-relational techniques 3 h

Target:

This course doesn't intend to train veterinarians who are experts in behavior but to lay the foundations for introducing the student into the discipline of behavioral medicine. So as for previous knowledge, students must have the appropriate bases of Anatomy, Physiology and Veterinary Biochemistry as well as General Pathology, Medical Semeiotics and Medical Pathology.

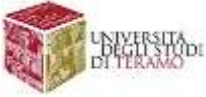
The concepts learned will allow the student to integrate the clinical behavioral reasoning with an observation of the animal with the knowledge of the ethology and communication of the dog and the cat to reveal signs and symptoms during the behavioral visit; nevertheless, these notions will also improve the evaluation of the patient for the clinical medical aspect.

Moreover, thanks to the notions related to neurophysiology, psychopathology and psychopharmacology, the student can set a clinical behavioral course from behavioral semiology to the diagnostic hypothesis, reaching, through a differential diagnosis, the three levels of



diagnosis, correlated by a prognosis and the choice of intervention behavioral integrated where necessary by a biological and/or pheromonal therapy. The main lines of behavioral modification of the animal will also be mentioned, based on a modern cognitive-relational approach.

The theoretical activity will have a practical application through videos of symptoms related to behavioral pathologies and behavioral visits carried out at the OVUD facilities.



Veterinary Clinical Obstetrics, Andrology and Gynaecology (7 CFU)

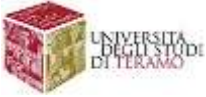
- Veterinary Clinical Obstetrics, Andrology and Gynaecology
Augusto Carluccio

Veterinary Clinical Obstetrics, Andrology and Gynaecology

Augusto Carluccio

Veterinary neonatology

- 1)** Case report in cattle, mares, ewes, bitches, queens and male animals.
- 2)** PART ONE: Pregnancy and Parturition
 - Prolapse of the vagina and cervix: treatment.
- 3)** PART TWO: Dystocia and Other Disorders Associated with Parturition
 - General considerations;
 - Approach to an obstetric case;
 - Maternal dystocia: diagnosis and treatment;
 - Fetal dystocia: etiology and incidence;
 - Manipulative delivery per vaginam: farm animals and horses;
 - Vaginal manipulations and delivery in bitches and queen cats;
 - Dystocia due to fetomaternal disproportion: diagnosis and treatment;
 - Dystocia due to postural defects: diagnosis and treatment;
 - Dystocia due to defects of position or presentation: diagnosis and treatment;
 - Dystocia due to twins or monstrosities;
 - Injuries and diseases incidental to parturition;
 - Post parturient prolapse of the uterus.
- 4)** PART THREE: Operative Interventions
 - The caesarean operation and the surgical preparation of teaser males;
 - Genital surgery in bitches and queen cats;
 - Fetotomy.
- 5)** PART FOUR: Infertility
 - Infertility in cows: structural and functional abnormalities, management deficiencies and non-specific infections.
 - Specific infectious diseases causing infertility in cattle.
 - Veterinary control of herd fertility;
 - Infertility in ewes and does (female goats);
 - Infertility in mares;
 - Infertility in sows and gilts;



- Infertility in bitches and queens.

6) PART FIVE: Male Animals

- Normal reproduction in male animals;
- Fertility and infertility in male animals.

Veterinary neonatology

Alberto Contri

This course aims at providing students with theoretical and practical information regarding physiology, management and clinical approach (pathogenesis, diagnosis and treatment) in domestic new-born animals until 3 weeks of age. The topics are subdivided by species in order to describe the peculiarities of different domestic animals.

As for equine neonatology, the main topics are: i) the placenta evaluation; ii) the clinical evaluation of colts; iii) the management of normal and ill colts; iv) diagnosis, treatment and prevention of the main diseases in new-born foals.

As for canine and feline neonatology, the topics are: i) adaptation of the puppy to extrauterine life; ii) management and clinical evaluation of puppies; iii) diagnosis, treatment and prevention of the main diseases in new-born puppies and kittens.

As for bovine neonatology, the topics are: i) clinical evaluation of the calf; ii) detection, diagnosis, treatment of diseases in farms that involve new-born calves.

Finally, as for pigs, the topics are: i) the evaluation of farm data for the detection of piglet disease; ii) clinical evaluation of piglets; iii) diagnosis, treatment and prevention of the main diseases of new-born piglets in intensive farming.



Surgical clinic of small animals (6 CFU)

Lucio Petrizzi

The skeletal system:

- Orthopedic examination;
- Fractures (classification, healing, complicated fractures, non-healing fractures);
- Luxation, clinic and imaging;
- Patella luxation, clinic and imaging;
- Hip luxation, clinic and imaging;
- Hip dysplasia, clinical diagnosis, imaging, treatment;
- Legg-calve-pertres disease;
- Elbow dysplasia;
- Other developmental or inherited diseases;
- Cranial cruciate ligament rupture, clinic, imaging techniques and treatment.

The respiratory system:

- Upper airway examination;
- Turbinopathies (aspergillosis, lymphoplasmacytic rhinitis, CE disease, dental fistula);
- Tonsillitis;
- Brachycephalic syndrome;
- Laryngeal hemiplegia;
- Tracheal collapse;
- Pleural effusions;
- Sinusitis.

The digestive system:

- Salivation changes;
- Diseases of the oesophagus (esophagitis, mega oesophagus, oesophageal occlusion, oesophageal diverticula, neoplasms, CE), clinic and imaging techniques;
- Acute abdomen, clinic and imaging;
- Dilatation and gastric volvulus, clinic, imaging, treatment;
- Intestine (invagination, CE, bowel obstruction, faecal impaction, volvulus);
- Perineal glands (perineal fistulas), diagnosis and treatment.

The urinary system:

- Imaging modalities for the diagnosis of urinary tract diseases;
- Ectopic ureter;
- Urolithiasis;
- Neoplasms.

The reproductive system:

- Sticker sarcoma;



- Cryptorchidism;
- Fracture of the penile bone.