

DEPARTMENT OF VETERINARY PHYSIOLOGY AND BIOCHEMISTRY

SEMESTER -I

VETERINARY PHYSIOLOGY -I (Blood, Cardiovascular, Excretory system and Body Fluids)

VPB –111

Credit Hours: 2+1=3

THEORY

Introduction to Blood; Properties of blood as a body fluid, metabolism and fate of R.B.C; Hemoglobin-chemical structure, synthesis, physiological functions, derivatives of hemoglobin; Anemia; Plasma proteins, lipids -origin and function; Coagulation mechanisms and regulation of haemostasis; fibrinolysis; anticoagulation mechanism. Blood pH, Wood volume and their determination. Osmotic fragility, erythrocyte sedimentation rate, haemtocrit and haemolysis; Leucocyte- phagocytic and immunogenic functions.

Heart- morphological characteristic, systemic excitability conduction & transmission processes. Cardiac Cycle:-Regulation of cardiac output; coronary circulation; properties of pulse; metabolism & energetic of working myocardial cell, extrinsic and intrinsic regulation; ECG and its significance in Veterinary Sciences - Echocardiography.

Haemodynamics of circulation, circulatory mechanics, resistance to flow, vasoconstriction, nervous and circulating fluid volume controls of blood pressure, neurohormonal control of vascular smooth muscle. Circulatory controls- shock stresses, regional and fetal circulations. Capillary exchange, control of blood pressure. Adjustments of circulation during exercise.

Kidney:- Functional morphology of nephron, factors determining filtration pressure, determination of glomerular filtration rate (GFR) and renal plasma flow -Reabsorption mechanisms for glucose, protein, amino acids, electrolytes; ammonium mechanism, glomerulotubular balance, methods of studying renal functions; urine concentration; micturition, uraemia.

Fluid, water balance, fluid therapy, dehydration, water concentration mechanisms. Acid base balance and H⁺ regulation, correction and evolution of imbalances, total osmotic pressure, potassium balance, electrolyte and water imbalances, thirst Formation and excretion of urine in Birds.

Cerebrospinal fluid, synovial fluids -composition, formation and flow; Joints. Regulations of bone metabolism and homeostasis.

PRACTICAL

Collection of blood samples - Separation of serum and plasma - Preservation of defibrinated blood -enumeration of erythrocytes, leucocytes - differential leucocytic count -platelet count - estimation of hemoglobin -haemotocrit - erythrocyte sedimentation rate - packed cell volume - coagulation time -bleeding time - Erythrocyte fragility and viscosity - blood grouping - recording of ECG -measurement of arterial blood pressure (Sphygmomanometry). Recording of cardiogram of frog heart- Study the effect of heat and cold on heart -effect of vagus stimuli on heart - vagal escape - factors affecting blood flow through blood vessels- urine analysis - physiological constituents, pathological determinates, determination of GFR. Titerable acidity, determination of inorganic phosphorus, urine ammonia and creatinine in urine.

SEMESTER- II

VETERINARY PHYSIOLOGY -II (Neuromuscular, Digestive and Respiratory systems)

VPB-121

Credit Hours: 2+1 =3

THEORY

Muscle Physiology- basic muscle unit characteristic-electrical phenomenon in muscle cell - Membrane potential ionic basis of resting membrane potential, muscle action potential, excitation and propagation of impulse characteristics- latent period refractive ness, threshold level-all & none characteristics - contractile mechanism- excitation -contraction coupling- neuro-muscular transmission, types of muscle contraction, phenomenon of fatigue, rigor mortis.

Organization of nervous system- Mechanism of information processing, hierarchical control. Major functional system- sensory, consciousness, emotion, motor and visceral control and basic functional unit - neuron structure, type- functional characteristics of sub-units of neuron. Membrane potential- ionic basis of resting membrane potential (RMP) nerve action potential, excitation and propagation of impulse characteristics- latent period -refractive ness, threshold level-all & none characteristics. Degeneration and regeneration of nerve fibre. Synaptic and junctional transmission.

Functions of nervous system-reflexes-control of posture and movements, autonomic nervous system and visceral control. Neurotransmitter wakefulness, sleep cycle. Higher function of neurons system -learning memory. Familiarization with common equipments used in neurophysiology (oscilloscope, electroencephalography, machine stimulators etc).

Sense organs and receptors physiology of special senses - EYE: functional morphology, nourishment and protection neural pathway, receptors - optics, ocular muscles and movements, photochemistry, eye defects and eye examinations (as an aid to clinical evaluation). EAR: Physiology of hearing and common hearing impairment. Vestibule apparatus. Physiology of Olfaction And Taste.

Morphological characteristic of monogastric and poly gastric digestive system. Prehension, rumination; defecation, vomition; regulation of secretory function of saliva, stomach, intestine, pancreas; bile secretion; hunger, appetite control, developmental aspects of digestion; luminous, membranous and microbial digestion in rumen and intestine; permeability characteristics of intestine, forces governing absorption, control intestinal transport of electrolyte and water, enzymatic digestion in monogastric and fermentative digestion in rumen, modification of toxic substances in rumen. Digestion in birds.

Functional morphology of respiratory apparatus. Mechanics of breathing. Transport of blood gases, foetal and neonatal oxygen transport, dissociation curves, pressures, recoil tendency, elasticity, surfactants, pleural liquid, compliance, exchanges of gases in lungs and tissues, neural and chemical regulation of breathing, diffusion, perfusion, hypoxia. Frictional resistance to air flow, airways smooth muscle contraction, respiratory muscle work, panting, adaptation of respiration during muscles exercise high attitude hypoxia, Non-respiratory lung functions. Respiration in birds.

PRACTICAL

Counting of rumen motility, estimation of volatile fatty acids and ammonia in rumen. Bacterial and protozoa count *in-vitro* action of proteolytic enzymes - pepsin and trypsin.

Experimental physiology. Pithing of frog, preparation of nerve muscle-Recording of twitch response, effect of single stimulus- effect of heat and cold. Fatigue - summation, tetanus. Recording of respiration, spirometry. Recording of volume and capacities in different physiological states including determination of vital capacities Recording of rumen / intestinal movements (Demonstration)

REFERENCE BOOKS

1. Dukes Physiology of Domestic animals – Edited by Melvin J Swenson.
2. Review of Medical Physiology – William Ganong.
3. Text book of Medical Physiology – Arthur C. Guyton.

SEMESTER- IV

VETERINARY PHYSIOLOGY - III

(Endocrinology, Reproduction, Growth and Environmental Physiology)

VPB-221

Credit Hours: 3+1=4

THEORY

Hormone cell interaction, sub-cellular mechanisms-metabolism of hormones-methods of study of endocrine system; Receptors- mechanism of regulation; Chemistry of hypothalamo -hypophyseal hormones, target organ, pineal, thyroid, thymus, pancreas, adrenal, prostaglandins, hormones of calcium metabolism, disorders, rennin-angiotensin system, atrial natriuretic factors, erythropoietin, GI hormones, pheromones.

Genetic & endocrine control of gonadal development modification of gonadotrophin release, ovarian functions, follicular development dynamics, endocrine and receptor profiles, sexual receptivity, ovarian cycle, post partum ovarian activity, ovum transport, capacitation, fertilization, reproductive cycles in farm animals- hormones present in the biological fluids during pregnancy and their uses for the diagnosis of pregnancy -maternal foetal placental participation in pregnancy & parturition, immunology of gestation, preparturient endocrine events.

Spermatogenic cycle and wave- function of Sertoli cell-leydig cell- semen - composition-evaluation; Testosterone - function and regulation - cryptorchidism. Puberty - photoperiod- uses of androgens, progestogens, estrogens.

Functional and metabolic organization of mammary glands -structure and development; effect of estrogens and progesterone; hormonal control of mammary growth; lactogenesis and galctogenesis; biosynthesis of milk constituents- secretion of milk, mastitis and metabolism, prolactin and mammary tumours.-lactation cycle.

Biochemical and genetic determinants of growth, regulation of growth, metabolic and hormone interactions, factors affecting efficiency of growth and production in ruminants and single stomach animals. Growth in meat producing animals & birds, growth curves. Recombinant gene transfer technologies for growth manipulation- advantages and limitations. Protein deposition in animals and poultry.

Heat balance, heat tolerance, hypothermia, hyperthermia, thermo-regulation in farm animals, role of skin, responses of animals to heat and cold, fever, body temperature and hibernation. Temperature regulation in birds.

Climatology -various parameters and their importance. Effect of different environmental variables like temperature, humidity, light, radiation, altitude on animal performance. Acclimation, acclimatization -general adaptive syndrome. Clinical effect on endocrine -reproductive function, circadian rhythm.

Neurophysiology of behaviour, types of behaviour, communication, Learning and memory, behavioural plasticity.

PRACTICAL

Oestrus and phases of oestrous cycle in animals (vaginal mucus). Behavioural signs of oestrus. Bio-assay for trophic hormone. Demonstration of hormone estimation. Rectal palpation of reproductive organs. Sperm motility, sperm concentration - live and dead - abnormal sperm count. Measurement of growth in various species. Measuring surface area of animals. Health parameters of animals-body temperature, pulse, respiration and heart rate. Measurement of animal environmental conditions. Behaviour of animals- mating behaviour, milking behaviour, feeding behaviour (live/videographic/computer simulated demonstration)

REFERENCE BOOKS

1. Dukes Physiology of Domestic Animals – Edited by Melvin J Swenson.
2. Text book of Medical Physiology – Arthur C. Guyton.
3. Veterinary Endocrinology & Reproduction – by Mc. Donald.
4. Reproduction in Farm Animals – by E.S.E. Hafez.
5. Adaptation in Domestic animals - E.S.E. Hafez and B. Hafez.

SEMESTER- I

GENERAL VETERINARY BIOCHEMISTRY

VPB-112

Credit Hours 1+1=2

THEORY

Scope and importance of biochemistry. Structure of biological membranes and transport across membranes. Donnan membrane equilibrium. Dissociation of acids, pH, buffer systems, Henderson-Hasselbalch equation.

Biochemistry of carbohydrates: Biological significance of important Monosaccharides (ribose, glucose, fructose, galactose, mannose and amino sugars), Disaccharides (maltose, isomaltose, lactose, sucrose & cellobiose), Polysaccharides, (starch, dextrans, dextrans, glycogen, cellulose, insulin, chitin), and Mucopolysaccharides including bacterial cell wall polysaccharides.

Biochemistry of lipids: Properties and biological significance of simple, compound and derived lipids and lipoproteins. Structure and functions of prostaglandins. Chemistry of bile and bile acids.

Biochemistry of proteins: Structure, properties and biological significance of proteins. Amino acids: classification and structure of neutral, basic and acidic amino acids. Properties of amino acids: amphoteric nature, optical activity, and peptide bond formation. Chemical reactions of proteins.

Biochemistry of nucleic acids: Chemistry of purines, pyrimidines, nucleosides and nucleotides. Biological significance of nucleosides & nucleotides. Structures and functions of deoxyribonucleic acid (DNA) and a typical ribonucleic acid (RNA).

PRACTICAL

Concentration of solutions - System international (S.I.) Units. Preparation/standardization of acids & alkalis. Preparation of buffers and determination of pH. Titration curve of acid versus base. Reactions of mono-, di-, and polysaccharides and their identification. Estimation of lactose in milk Determination of acid number of an oil. Colour reactions of proteins. Precipitation reactions of proteins. Estimation of amino acids (Sorensen's method)

SEMESTER –II

VETERINARY INTERMEDIARY METABOLISM

VPB-122

Credit Hours 2+1=3

THEORY

Enzymes: Definition and classification, EC numbering of enzymes. Coenzymes, cofactors & iso-enzymes. Properties: Protein nature, enzyme-substrate complex formation, modern concept of the active center of enzyme. Specificity of enzyme action: Substrate specificity, group specificity, stereo or optical specificity. Factors influencing enzyme action: Effects of temperature, pH, concentration of substrate and enzyme.

Enzyme units: International Units, katal, turnover number & specific activity.

Enzyme inhibition: Competitive, non-competitive, uncompetitive inhibition & suicidal inhibition. Allosteric enzymes.

Biological oxidation: Enzymes and coenzymes involved in oxidation and reduction viz. Oxidoreductases, oxidases, oxygenases, dehydrogenases, hydroperoxidases & cytochromes.

Respiratory chain/ electron transport chain, oxidative phosphorylation, inhibitors, uncouplers and other factors influencing electron transport chain.

Carbohydrate metabolism: Glycolysis, Kreb's cycle, glyoxylate cycle, HMP shunt, gluconeogenesis, Cori cycle, glycogenesis, glycogenolysis, hormonal control of carbohydrate metabolism & regulation of blood sugar Bioenergetics of carbohydrate metabolism

Lipid metabolism: Bete oxidation of fatty acids, ketone body formation, biosyntheses of fatty acids, triacylglycerol, phospholipids & Apoprotein metabolism. Bioenergetics of lipid metabolism.

Protein metabolism: Biosynthesis and degradation. Deamination, transamination and decarboxylation of amino acids. Ammonia transport and urea cycle

Nucleic acids: Metabolism of purines and pyrimidines. DNA & RNA biosynthesis.

Integration of metabolism. Metabolic functions of macro and micro nutrients, Metabolic functions of lipid and water soluble vitamins. Uses of isotopes in metabolic studies.

PRACTICAL

Effect of pH and temperature on enzyme activity. Estimation of normal / abnormal constituents of urine. Electrophoretic separation of proteins. Paper chromatography. Estimation of bilirubin, blood glucose, electrolytes and other metabolic intermediaries in blood (colorimetry/ spectrophotometry/ flame photometry).

SEMESTER- VI

ANIMAL BIOTECHNOLOGY

VPB-321

Credit Hours 2+1=3

THEORY:

Definitions, basic concepts and scope of animal biotechnology. Recombinant DNA technology. Gene cloning, vectors and expression vectors. Transformation and transfection. Polymerised chain reaction (PCR), construction of genomic library and cDNA library. DNA sequencing. Principles of transfer of nucleic acids and proteins (Southern, Northern and Western blotting), Nucleic acid hybridization, DNA probes and DNA fingerprinting.

Biotechnological application in animal improvements:

Embryo biotechniques, *in-vivo and in-vitro* embryo production and preservation, sexing, micromanipulation and cloning, transgenic animal and biopharming.

Mapping of genome and genome sequencing. Marker assisted selection. Gene banking.

Nutritional biotechnology including bioconversion of lignocellulose, genetic manipulation of microbes for improved feed utilization and health. Animal tissue culture, transformation and cell lines, tumor markers and acute phase proteins

Molecular diagnosis including PCR and DNA probes. Hybridoma and monoclonal antibodies.

New generation vaccines: Subunit recombinant and recombinant vectored vaccines

Fermentation process and technologies for milk, meat and leather. Ethics and regulatory issues in Biotechnology. IPR. Bioinformatics.

PRACTICAL

DNA and plasmid isolation. Gel electrophoresis. PCR. Screening of gametes and embryo. Use of Multimedia and audio-visual aids for molecular biology aspects.

(The course is to be taught jointly with the Departments of Veterinary Microbiology and Veterinary Gynaecology and Obstetrics)

REFERENCE BOOKS

1. **Harper's Biochemistry**. XXV edition. 2002. Robert K. Murray; Daryl K Granner; Peter A. Mayes & Victor W. Rodwell. Published by McGraw – Hill Health professions Division, London.
2. **Textbook of Biochemistry**. IV edition. 1974. Edward Staunton West; Wilbert R. Todd; Howard S. Manson & John T. Van Brugeen. Published by Oxford and IBM publishing co. Pvt. Ltd., New Delhi.
3. **Biochemistry**. V edition. 2002. Jeremy M. Berg; John L. Tymoczko & Lubert Stryer. Published by W.H. Freeman & company, New York.
4. **Biochemistry – A concise text for Medical Students**. V edition. 1992. D. K. Apps; B. B. Cohen & C. M. Steel. Published by ELBS with Bailliere Tindall.
5. **Lehninger Principles of Biochemistry**. IV edition. 2005. David L. Nelson & Michael M. Cox. Published by Wiley Freeman & Company, New York.
6. **Fundamentals of Biochemistry for Medical Students**. VII edition. 1998. Ambika Shanmugam. Published by the Author, Chennai.

7. **Introduction to Biotechniques – PCR.** II edition. 1997. C. R. Newton & A. Graham. Published by BIOS Scientific Publishers Ltd. Oxford.
8. **Textbook of Medical Physiology.** X edition. 2000. Arthur C. Guyton & John E. Hall. Published by W. B. Saunders company – A Harcourt health Science company, Singapore.
9. **Biochemistry.**1993. S. C. Rastogi. Published by Tata McGraw-Hill Publishing company Ltd., New Delhi.
10. **Biochemistry and Molecular Biology.** 1997. William H. Elliott & Daphne C. Elliott. Published by Oxford University press, Oxford.
11. **Essentials of Molecular Biology.** II edition. 1993. David Freifelder & George M. Malacinski. Published by Panima publishing corporation, New Delhi.
12. **Trends in Molecular biology and Biotechnology.** 1996. Ed. By Sheela Srivastava; P. S. Srivastava & B. N. Tiwary. Published by CBS Publications & Distributors, New Delhi.
13. **Molecular and Cell Biochemistry – Molecular biology and Biotechnology.** 1991. Smith & Wood. Published by Chapman & Hall, Madras.
14. **Principles of Gene Manipulation – An introduction to genetic Engineering.** V edition. 1994. R. W. Old & S. B. Primrose. Published by Blackwell Science Ltd. Berlin.
15. **Methods in Biotechnology. Animal Cell Biotechnology – Methods & Protocols.** 1999. Ed. by. Nigel Jenkins. Published by Human Press Inc., New Jersey.

* Latest editions may be followed.