

VETERINARY PHYSIOLOGY

Course Structure

COURSE NO.	COURSE TITLE	CREDITS	SEM
VPY 601	PHYSIOLOGY OF DIGESTION	2+1	I
VPY 602	CARDIOVASCULAR AND RESPIRATORY PHYSIOLOGY	2+1	I
VPY 603	RENAL PHYSIOLOGY AND BODY FLUID DYNAMICS	2+1	I
VPY 604	HAEMATOLOGY	2+1	I
VPY 605	VITAMINS AND MINERALS IN ANIMAL PHYSIOLOGY	2+0	I
VPY 606	PHYSIOLOGY OF ANIMAL REPRODUCTION	2+1	II
VPY 607	CLINICAL PHYSIOLOGY	2+1	II
VPY 608	NEUROMUSCULAR PHYSIOLOGY	2+1	II
VPY 609	CHEMICAL BIOREGULATION IN PHYSIOLOGICAL FUNCTIONS	3+0	II
VPY 610	RESEARCH TECHNIQUES IN VETERINARY PHYSIOLOGY	0+2	II
VPY 691	MASTER'S SEMINAR	1	I, II
VPY 699	MASTER'S RESEARCH	20	I, II
VPY 701	APPLIED PHYSIOLOGY OF BODY FLUIDS AND ELECTROLYTES	2+1	I
VPY 702	PHYSIOLOGY OF ANIMAL BEHAVIOUR	2+0	I
VPY 703	COMPARATIVE PHYSIOLOGY OF RUMINANT DIGESTION	2+1	I
VPY 704	ADVANCES IN NEURO-ENDOCRINOLOGY	2+1	I
VPY 705	MYOPHYSIOLOGY AND KINESIOLOGY	2+1	I
VPY 706	AVIAN PHYSIOLOGY	2+1	I
VPY 707	PHYSIOLOGY OF LACTATION	2+1	II
VPY 708	ADVANCES IN ENVIRONMENTAL PHYSIOLOGY AND GROWTH	2+1	II
VPY 709	ADVANCES IN RUMEN MICROBIOLOGY AND METABOLISM	2+1	II
VPY 710	ADVANCES IN IMMUNOPHYSIOLOGY	2+1	II
VPY 711	PHYSIOLOGY OF STRESS	2+1	II
VPY 790	SPECIAL PROBLEM	0+2	I, II
VPY 791	DOCTORAL SEMINAR I	1	I, II
VPY 792	DOCTORAL SEMINAR II	1	I, II
VPY 799	DOCTORAL RESEARCH	45	I, II
SERVICE COURSE			
FN 511	ADVANCED HUMAN PHYSIOLOGY	2+1	I

VETERINARY PHYSIOLOGY

Course Contents

VPY 601 PHYSIOLOGY OF DIGESTION 2+1 SEM - I

Objective

To teach comparative physiology of digestive system of monogastric animals, ruminants and birds, and basic techniques.

Theory

UNIT-I: Basic characteristics and comparative physiology of digestive system of domestic animals.

UNIT-II: Gastro-intestinal motility, secretory functions of gastro-intestinal tract, their regulation and gastro-intestinal hormones.

UNIT-III: Absorption, metabolism and excretion of various nutrients, appetite and control of feed intake.

UNIT-IV: Development of ruminant system and rumen environment. Ruminant microbial digestion, its advantages and disadvantages. Rumino-reticular motility, its significance and control.

UNIT-V: Rumen microbiology. Digestion in birds.

Practical

Collection of saliva and its enzymatic studies. Activity of pepsin and trypsin enzymes. Gastric and intestinal motility. Estimation of digestive metabolites such as glucose, ketone bodies, triglycerides, cholesterol, urea- nitrogen and total proteins. Liver function tests. Method of collection of rumen liquor, merits and demerits. Determination of pH, total volatile fatty acids, ammonia-nitrogen and total-nitrogen in strained rumen liquor. Rate of passage of digesta and its estimation. Rumino-reticular movements. Artificial rumen, counting of protozoa and bacteria.

Suggested Readings

Church DC. 1988. *Digestive Physiology & Nutrition of Ruminants*. Prentice Hall.

Cunningham JG. 1992. *Text book of Veterinary Physiology*. WB Saunders.

Forbes JM. & France J. 1993. *Quantitative aspects of Ruminant Digestion & Metabolism*. CABI.

Hungate RE. 1966. *Rumen and its Microbes*. Academic Press.

Swenson MJ & Reece WO. 2005. *Duke's Physiology of Domestic Animals*. Panima.

VPY 602 CARDIOVASCULAR AND RESPIRATORY 2+1 SEM - I
PHYSIOLOGY

Objective

To teach function and regulation of heart, recording of ECG and respiration in different animals and basic techniques.

Theory

UNIT-I: Heart muscle, heart as pump, origin and propagation of heart beat. Electrophysiology of heart, rhythmic excitation of heart, cardiac cycle, heart sound and dynamics of valvular and congenital heart defect.

UNIT-II: Cardiac output and its measurements, factors affecting cardiac output. Venous return and its regulation. Control of the heart.

UNIT-III: Normal electro-cardiogram, electrocardiographic interpretation in cardiac myopathies and cardiac arrhythmias.

UNIT-IV: Circulation and hemodynamics, coronary, systemic and pulmonary circulation, their regulation, energetics of circulation, pathophysiology of circulation.

UNIT-V: Respiration, mechanism of ventilation, hemoglobin, oxygen and carbon- dioxide transport. Respiratory gas exchange. Respiratory adjustment at high altitude and deep swimming. Neural and chemical control of respiration, artificial respiration. Respiration in birds.

Practical

Determination and recording of cardiac output, blood pressure and electrocardiogram, blood volume. Estimation of lung volumes and capacities by spirometry, effect of various levels of exercise on lung functional capacities. Estimation of blood gases.

Suggested Readings

Cunningham JG. 1992. *Text book of Veterinary Physiology*. WB Saunders.
Ganong FW. 2003. *Review of Medical Physiology*. Prentice-Hall.
Patton 1989. *Howell's Text book of Physiology*. WB. Saunders.
Swenson MJ & Reece WO. 2005. *Duke's Physiology of Domestic Animals*. Panima.

VPY 603 RENAL PHYSIOLOGY AND BODY FLUID 2+1 SEM - I
DYNAMICS**Objective**

To impart knowledge regarding excretory system of mammals and birds, maintenance of body fluid homeostasis.

Theory

UNIT-I: An overview of nephron structure and function. Renal homeostatic function and renal excretory function.

UNIT-II: Quantitative analysis of renal function, renal haemodynamics. Glomerular filtration- its mechanism and measurement. Permselectivity of the glomerular capillary wall, structural basis of GFR, tubular reabsorption and transport.

UNIT-III: Role of kidney in acid-base balance. Physiology of micturition, endocrine control of renal function. Non excretory functions of kidney.

UNIT-IV: Skin- general anatomy of epidermis, dermis, hypodermis, mechanical protection, permeability, actinic irradiation, sweat glands, sebaceous glands. Skin grafting. Immune properties of skin.

UNIT-V: Composition of body fluids and their regulation. Excretory system in birds.

Practical

Collection and preservation of urine. Physical and chemical analysis of urine and its interpretation in health and disease condition. Demonstration of various kidney function tests, glomerular filtration rate, creatinine clearance rate, urea clearance rate and glucose tolerance test.

Suggested Readings

Klahar S. 1983. *The Kidney and Body Fluids in Health and Diseases*. Plenum Press.
Swenson MJ & Reece WO. 2005. *Duke's Physiology of Domestic Animals*. Panima.

VPY 604 HAEMATOLOGY 2+1 SEM - I**Objective**

To acquaint the students about haematology of different animals including hands-on training.

Theory

UNIT-I: Red blood cells, anaemia, different types of anaemia, polycythemia and their effect on circulation in mammals and birds.

UNIT-II: Resistance of the body to infection, leukocytes, tissue macrophage system and inflammation.

UNIT-III: Immunity, immunoglobulins, immunogenetics, polymorphism in hemoglobin, transferrin etc. Changes in blood during diseases. Iatrogenic blood diseases, hemorrhagic diathesis, hemophilias.

UNIT-IV: Hemostasis and coagulation factors, role of platelets, fibrinolysis. Blood groups, transfusion of blood. Tissue and organ transplantation. Conditions causing bleeding disorders.

Practical

Haemograms, platelet count, erythrocyte fragility. Estimation of serum iron and iron binding capacities of plasma. Separation of variants of hemoglobin and transferrin by electrophoresis. Examination of bone marrow. Isolation of different types of blood cells by sedimentation and column chromatography.

Suggested Readings

Dacie JV & Lewis SM. 1991. *Practical Hematology*. Churchill Livingstone.
Jain NC. 1993. *Essentials of Veterinary Hematology*. Lea & Febiger.
Rapaport SI. 1987. *Introduction to Hematology*. JB Lippincott.

VPY 605 VITAMINS AND MINERALS IN ANIMAL 2+0 SEM - I
PHYSIOLOGY

Objective

To teach the importance of these nutrients in normal body functions and in disease conditions.

Theory

UNIT-I: Introduction and brief history, definition, general properties and overview of functions.

UNIT-II: Fat soluble vitamins, their functions and deficiency diseases.

UNIT-III: Water soluble vitamins and vitamin-like compounds, their functions and deficiency diseases.

UNIT-IV: Physiological functions of trace elements, their role in metabolism, toxicity, deficiency diseases.

Suggested Readings

McDowell LR. 1989. *Vitamins in Animal Nutrition*. Academic Press.

Underwood EJ. 1977. *Trace Elements in Human and Animal Nutrition*. Academic Press.

VPY 606 PHYSIOLOGY OF ANIMAL 2+1 SEM - II
REPRODUCTION

Objective

To impart knowledge of male and female reproductive system of different species of animals including birds.

Theory

UNIT-I: Functional histomorphology of male and female reproductive system, development of male and female sex organs. Endocrine and neuroendocrine relation in male and female reproductive function in different domestic animals.

UNIT-II: Sexual cycles and mating behaviours in females, oogenesis, folliculogenesis and ovulation. Secretions of female reproductive tract in different species of animals.

UNIT-III: Male mating behaviour, spermatogenesis, spermiogenesis, Seminiferous, epithelial cycles. Spermatozoa- structure and composition, maturation and transportation. Secretions of male reproductive tract.

UNIT-IV: Transport of male and female gametes, fertilization, implantation. Pregnancy and parturition. Post-partum recovery in different species of domestic animals.

Practical

Heat detection in different animals, palpation of reproductive organs. Physical and biochemical evaluation of semen, determination of sperm enzyme, leakage during freezing. Preservation of semen, RIA of steroid hormones.

Suggested Readings

Hafeez ESE. 2000. *Reproduction in Farm Animals*. Lippincott, Williams & Wilkins.

Pineda & Doley 2003. *McDonald's Veterinary Endocrinology*. Iowa State University Press, Ames.

Salisbury GW & Demark NL. 1978. *Physiology of Reproduction and Artificial Insemination*. WB Saunders.

Swenson MJ & Reece WO. 2005. *Duke's Physiology of Domestic Animals*. Panima.

VPY 607 CLINICAL PHYSIOLOGY 2+1 SEM - II

Objective

To teach physiological basis of clinical abnormalities in body functions.

Theory

UNIT-I: Cardiovascular, respiratory, hepatic and renal evaluation of body functions in relation to clinical conditions.

UNIT-II: Carbohydrate, fat, protein and mineral metabolism in health and disease of various species.

UNIT-III: Functions and dysfunctions of liver, kidney and gastro-intestinal tract.

UNIT-IV: Clinico-immunological evaluation of immune responses and clinical enzymology.

Practical

Qualitative tests for glucose, ketone bodies, protein and calcium in urine. Quantitative determination of glucose in blood and urine. Electrophoresis of plasma proteins. Determination of sodium and potassium in serum. Determination of serum chloride.

Separation of amino acids. Thin-layer chromatography of serum lipids.

Suggested Readings

- Henry RJ. 1974. *Clinical Chemistry. Principles and Techniques*. Harper & Row.
Kaneko JJ, Harvey JW & Bruss ML. 1997. *Clinical Biochemistry of Domestic Animals*. Academic Press.
King EJ & Wooton IDP. 1956. *Microanalysis in Medical Biochemistry*. Churchill Livingstone.
Oser BL. 1976. *Hawk's Physiological Chemistry*. Tata McGraw-Hill.
Rose BD. 1989. *Clinical Physiology of Acid Base and Electrolyte Disorders*. McGraw-Hill.
Tietz NW. 1970. *Fundamentals of Clinical Chemistry*. WB Saunders.

VPY 608 NEUROMUSCULAR PHYSIOLOGY 2+1 SEM - II

Objective

To impart knowledge of coordination of body functions and regulation of brain functions and sense organs.

Theory

UNIT-I: Types and classification of muscles, comparative histopathology of muscles. Skeletal muscle fibers, membrane and action potential at myoneuronal junction. Molecular characteristics of contractile filaments, molecular mechanism of muscle contraction, relationship between actin and myosin filaments, overlap and tension developed by the contracting muscles. Contractile process of smooth muscles.

UNIT-II: Length and tension relationship, force and velocity relationship. Skeletal muscle energetics, metabolism and lactate shuttle. Exercise, adaptation to training and performance. Neuromuscular disorders of domestic animals.

UNIT-III: Nervous system, synapse, transmission and processing of information, receptors, brain and spinal reflexes, motor functions of brain stem, limbic system, memory, sleep, learning, autonomic nervous system.

UNIT-IV: Special senses and somatic senses.

Practical

Recording of electro-myogram, fatigue, tetanus in muscles. Effect of temperature on different types of muscles, demonstration of intestinal movements, effect of drugs on all types of muscles, estimation of muscles specific enzymes.

Suggested Readings

- Basmajian JV. 1978. *Muscle Alive: their Functions Revealed by Electromyography*. Williams & Wilkins.
Cooper R. 1980. *EEG Technology*. Butterworths.
Klemm. WR. 1969. *Animal Electroencephalography*. Academic Press.
Smith R.F. 1978. *Fundamentals of Neurophysiology*. Springer Verlag.
Swenson MJ & Reece WO. 2005. *Duke's Physiology of Domestic Animals*. Panima.

VPY 609 CHEMICAL BIOREGULATION IN 3+0 SEM - II
PHYSIOLOGICAL FUNCTIONS

Objective

To acquaint the students about different endocrine glands of the body and their relationship with production.

Theory

UNIT-I: Methods to study bioregulation including methods of endocrine analysis. Manipulation and disruption of biorhythms in homeostatic and natural ecosystem.

UNIT-II: Hormonal relationship in animal production. Concepts in hormone function, classification and methods of study. Hormonal assay, mechanism of hormone synthesis, release and transport. Mechanisms of hormone action, target cell interactions.

UNIT-III: Genetic and genomic approaches in endocrinology. Animal models and alternate uses of animal model. Regulation and metabolism of hypothalamic, hypophyseal, thyroid and adrenal hormones.

UNIT-IV: Gonadal and placental hormones, their regulation and mechanism of action. Hormonal principles of pineal gland and its role in production.

UNIT-V: Endocrine control of carbohydrate and calcium homeostasis. Hormones and adaptation to environment. Hormonal regulation of gastro-intestinal activity. Prostaglandins. Hormones in fertility regulation and production augmentation. Avian

endocrinology.

Suggested Readings

Pineda MH & Doley MP. 2003. *McDonald's Veterinary Endocrinology*. Blackwell Publ.
Turner CD & Bagnara JT. 1976. *General Endocrinology*. WB Saunders.
Williams RH. 1982. *Text Book of Endocrinology*. WB Saunders.

VPY 610 RESEARCH TECHNIQUES IN 0+2 SEM - II
VETERINARY PHYSIOLOGY

Objective

Training in various techniques for application in research in Animal Physiology.

Practical

Recording of ECG, EMG, blood pressure, pulse rate, movement of GI tract by Physiograph. Gas Liquid Chromatography. Electrophoresis. Estimation of various electrolytes. Estimation of bacterial production rate and VFA production rate, solid and liquid digesta flow rates and body composition using radio-isotopes, *in vitro* and *in sacco* rumen studies, ELISA. R.I. A. techniques of various hormones.

Suggested Readings

Abraham GE. 1977. *Handbook of Radioimmunoassay*. Marcel Dekker.
Armstrong ML. 1978. *Electrocardiograms: A Systematic Method of Reading Them*. KM Verghese.
Oser BL. 1976. *Hawk's Physiological Chemistry*. Tata McGraw-Hill.
Smorto MP & Basmajian JV. 1979. *Clinical Electroneurography – An Introduction to Nerve Conduction Tests*. Williams & Wilkins.

VPY 701 APPLIED PHYSIOLOGY OF BODY 2+1 SEM - I
FLUIDS AND ELECTROLYTES

Objective

To teach physiological and clinical implication of changes in electrolytes and body fluids.

Theory

UNIT-I: Volume and composition of body fluids, exchange of water and electrolytes between body compartments, blood and external environment. Osmolarity of fluid.
UNIT-II: Regulation of volume and osmolarity of extra cellular fluid. Regulation of pH and acid base balance. Formation and composition of cerebrospinal fluid and lymph.
UNIT-III: Clinical implications of change in electrolytes and body fluids. Structural and functional consideration of plasma and its composition. Diuresis and endocrine control of renal functions.
UNIT-IV: Clinical feature in fluid and electrolyte imbalance, clinicopathological indicators of fluid and electrolytes imbalance.

Practical

Determination of electrolytes viz. sodium, potassium and chloride in plasma, determination of total body water and plasma volume by various techniques i.e. dye dilution and radioisotope technique, Estimation of osmolarity and osmolality of body fluids.

Suggested Readings

Selected articles from journals.

VPY 702 PHYSIOLOGY OF ANIMAL BEHAVIOUR 2+0 SEM - I

Objective

To impart knowledge on various aspects of animal behaviour viz. communication in animals, sexual behaviour, feeding behaviour etc.

Theory

UNIT-I: Introduction to animal ethology. Neurophysiological basis of animal behaviour.
UNIT-II: Behaviour in relation to changes in the environment. Feeding behaviour, grazing, stall feeding and rumination.
UNIT-III: Sexual behaviour in the female and male. Maternal behaviour. Milk let down.
UNIT-IV: Social behaviour, communication in animals, animal temperament. Response of dogs and horses to training.

Suggested Readings

Selected articles from journals.

VPY 703 COMPARATIVE PHYSIOLOGY OF 2+1 SEM - I
RUMINANT DIGESTION

Objective

To teach functional development of rumen and comparative digestive functions in different ruminant species.

Theory

UNIT-I: Functional development of ruminant stomach. Rumen motility and its control.

UNIT-II: Salivary secretion and its regulation. Intraruminal environment, rumen metabolites and their assimilation, NPN feeding, nitrogen recycling.

UNIT-III: Synthesis of microbial proteins and vitamins. Rumen dysfunctions. Comparative efficiency of rumen function in different species. Stoichiometry of carbohydrate fermentation.

UNIT-IV: Manipulation of rumen fermentation, protected nutrients feeding, probiotics supplementation etc. Rumen flow rate and rumen volume.

Practical

Reticulo-ruminal motility, artificial rumen techniques, total volatile fatty acids and their fractions, bacteria, protozoa and fungi in rumen. Flow rates of ruminal contents.

Suggested Readings

Selected articles from journals.

VPY 704 ADVANCES IN NEURO-ENDOCRINOLOGY 2+1 SEM - I

Objective

To acquaint the students about neuro-endocrine integrating mechanism in animals and birds.

Theory

UNIT-I: Neuroendocrine integrating mechanism. Structure of hypothalamus, pituitary gland, limbic and other neural pathways and endocrine functions.

UNIT-II: Neural control of oxytocin, adrenocorticotrophic hormone, aldosterone, thyrotrophic hormone, growth hormone, gonadotrophins etc. Hypothalamic releasing factors and the neuro-vascular link between brain and anterior pituitary.

UNIT-III: Role of afferent impulses from genitals and other regions in reproductive system. Influence of hormones on brain activity.

UNIT-IV: Effects of drugs on neuro-endocrine system. Neuro-endocrine mechanisms in birds. Interaction of nervous, endocrine and immune system in animal production and reproduction.

Practical

Radio-immuno assay of progesterone, effects of ovariectomy, effects of testosterone treatment. Bioassay of estrogens. Estimation of T3 and T4 in blood.

Suggested Readings

Selected articles from journals.

VPY 705 MYOPHYSIOLOGY AND KINESIOLOGY 2+1 SEM - I

Objective

To impart the knowledge regarding exercise and work physiology, molecular basis of muscle contraction.

Theory

UNIT-I: Structure of muscle, chemical composition, muscle contraction and irritability. Mechanical properties of skeletal muscle.

UNIT-II: Thermal properties of muscles. Chemical correlates of contraction.

UNIT-III: Molecular basis of muscular contraction of skeletal muscle. Pathophysiology of muscles and myocardium.

UNIT-IV: Lever systems of body joints, Synovial fluid formation and its physiology. Principles of Kinesiology and its application in work physiology.

Practical

Electromyogram, Tetany. Electro-cardiogram. Intestinal movements. Effects of various drugs on all types of muscles.

Suggested Readings

Selected articles from journals.

VPY 706	AVIAN PHYSIOLOGY	2+1	SEM - I
Objective			
To impart complete knowledge about physiology of domestic fowl and comparative physiology of other birds.			
Theory			
<u>UNIT-I</u> : Digestive and urinary system.			
<u>UNIT-II</u> : Blood, cardiovascular and respiratory system.			
<u>UNIT-III</u> : Reproductive and endocrine system.			
<u>UNIT-IV</u> : Nervous system and musculo-skeletal system.			
Practical			
Study of blood cells, haemoglobin, packed cell volume (haematocrit) and erythrocyte sedimentation rate. Determination of glucose, calcium, uric acid and urea in blood. Electrophoretic separation of plasma proteins and egg proteins.			
Suggested Readings			
Selected articles from journals.			
VPY 707	PHYSIOLOGY OF LACTATION	2+1	SEM - II
Objective			
To acquaint students with physiology and mechanism of lactation.			
Theory			
<u>UNIT-I</u> : Functional anatomy, histology and cytology of mammary gland in domestic animals.			
<u>UNIT-II</u> : Development of mammary gland, hormonal control of mammary gland growth.			
<u>UNIT-III</u> : Process of lactation, initiation of milk secretion, hormonal control of lactation. Biochemical and histological changes in mammary gland during lactation. Mechanism of galactopoiesis.			
<u>UNIT-IV</u> : Neural control of lactation, milk let down, milk ejection and inhibition of milk ejection. Induced lactation. Composition of milk in different species of animals.			
Practical			
Examination of normal udder of cow and buffalo. Composition of colostrum and milk during different phases of lactation. Effect of adrenalin and oxytocin on milk let down, artificial induction of lactation. Estimation of lactogenic hormones.			
Suggested Readings			
Selected articles from journals.			
VPY 708	ADVANCES IN ENVIRONMENTAL PHYSIOLOGY AND GROWTH	2+1	SEM - II
Objective			
To acquaint the students about co-relation of various environmental factors on growth and performance of animals.			
Theory			
<u>UNIT-I</u> : Ecology of farm animals, biological rhythms, mammalian circadian rhythms, their regulation. Components of physical environment, biometeorology and principles of thermoregulation in mammals and birds.			
<u>UNIT-II</u> : Physiological response of farm animals to heat and cold. Effect of various climatic components on health and production (growth and egg production), reproduction and climatic adaptation.			
<u>UNIT-III</u> : Concept and definitions of cellular, prenatal and postnatal growth- patterns in different species of domestic animals.			
<u>UNIT-IV</u> : Factors affecting live weight growth viz. nutrition, hormones, vitamins, antibiotics, environment. Ageing and senescence. Growth anomalies.			
Practical			
Growth measurement and growth curves, recording of various climatic variables, effect of climatic variables on growth and production.			
Suggested Readings			
Selected articles from journals.			

animals.

Practical

Measurement of various biochemical parameters during stress and /or exercise in animals, measurement of various hormones during different stresses in animals, measurement of cardio-respiratory reactions during stresses.

Suggested Readings

Selected articles from journals.

VPY 790

SPECIAL PROBLEM

0+2

SEM- I, II

Objective

To provide expertise in handling practical research problem(s).

Practical

Short research problem(s) involving contemporary issues and research techniques.

VETERINARY PHYSIOLOGY

List of Journals

- Acta Endocrinologica
- Advances in Clinical Chemistry
- Advances in Reproductive Physiology
- Advances in Veterinary Sciences
- American Journal of Clinical Nutrition
- American Journal of Physiology
- American Journal of Veterinary Research
- Animal Nutrition and Feed Technology
- Animal Reproduction Science
- Animal Sciences
- Annual Review of Physiology
- Buffalo Journal
- Domestic Animal Endocrinology
- Indian Journal of Animal Reproduction
- Indian Journal of Animal Nutrition
- Indian Journal of Animal Physiology
- Indian Journal of Animal Research
- Indian Journal of Animal Science
- Indian Veterinary Journal
- Journal of Endocrinology
- Journal of Physiology
- Journal of Reproduction and Fertility
- Neuroendocrinology

e-Resources

- <http://intl-joe.endocrinology-journals.org> (Journal of Endocrinology)
- <http://intl-ajpcon.physiology.org> (American Journal of Physiology)
- <http://arjournals.annualreviews.org> (Annual Review of Physiology)
- www.jneurosci.org (Journal of Neuroscience)
- www3.interscience.wiley.com (Journal of Physiology & Animal Nutrition)
- <http://jp.physioc.org> (Journal of Physiology)

Suggested Broad Topics for Master's and Doctoral Research

- Manipulation of rumen fermentation to enhance growth and productivity in ruminants.
- Normal renal functions of domestic animals.
- To study the mechanism of regulation of various hormones involved in production and reproduction in domestic animals.
- Dietary effects on growth and production in poultry.

VETERINARY BIOCHEMISTRY

Course Structure

COURSE NO.	COURSE TITLE	CREDITS	SEM
VBC 601	CHEMISTRY OF ANIMAL CELL	2+0	I
VBC 602	TECHNIQUES IN BIOCHEMISTRY	0+2	I, II
VBC 603	APPLICATIONS OF GENOMICS AND PROTEOMICS IN MOLECULAR BIOLOGY	2+0	II
VBC 604	BIOCHEMISTRY OF BIOMOLECULES: CARBOHYDRATES, LIPIDS AND MEMBRANE STRUCTURE	2+0	I
VBC 605	ENZYME CATALYSIS, KINETICS, INHIBITION AND REGULATION	2+0	II
VBC 606	METABOLISM-I: CARBOHYDRATES AND LIPIDS	2+0	I
VBC 607	METABOLISM-II: NUCLEIC ACIDS AND AMINO ACIDS	2+0	I
VBC 608	METABOLISM-III: INTEGRATION AND REGULATION	2+0	II
VBC 609	CENTRAL DOGMA AND PROTEIN FUNCTION	2+0	I
VBC 610	CLINICAL BIOCHEMISTRY OF ANIMALS	2+1	I
VBC 611	BIOCHEMICAL BASIS OF DISEASES OF DOMESTIC ANIMALS	2+0	II
VBC 612	ENDOCRINOLOGY AND REPRODUCTIVE BIOCHEMISTRY	2+0	II
VBC 613	BIOCHEMICAL BASIS OF ANIMAL PRODUCTION	2+1	II
VBC 691	MASTER'S SEMINAR	1	I, II
VBC 699	MASTER'S RESEARCH	20	I, II
VBC 701	ADVANCES IN BIOCHEMISTRY OF RUMINANT DISORDERS	2+0	II
VBC 702	ADVANCES IN ENZYMOLOGY	2+0	II
VBC 703	ADVANCES IN CLINICAL BIOCHEMISTRY	0+2	II
VBC 704	MEMBRANE DYNAMICS AND SIGNAL TRANSDUCTION IN ANIMAL CELL	2+0	I
VBC 705	METHODS IN PROTEIN ANALYSIS	2+1	I
VBC 706	NUTRITIONAL BIOCHEMISTRY	2+0	I
VBC 707	ADVANCES IN INTERMEDIARY METABOLISM	2+0	I
VBC 708	ENDOCRINE CONTROL OF FUEL METABOLISM	2+0	II
VBC 709	DIAGNOSTIC ENZYMOLOGY-I	2+0	I
VBC 710	DIAGNOSTIC ENZYMOLOGY-II	2+0	II
VBC 711	BIOCHEMISTRY OF DEVELOPMENT AND DIFFERENTIATION	2+0	I
VBC 712	ADVANCES IN TECHNIQUES IN BIOCHEMISTRY	0+2	I, II
VBC 713	ADVANCES IN MINERAL AND VITAMIN METABOLISM AND RELATED DISEASES	2+0	II
VBC 790	SPECIAL PROBLEM	0+2	I, II
VBC 791	DOCTORAL SEMINAR I	1	I, II
VBC 792	DOCTORAL SEMINAR II	1	I, II
VBC 799	DOCTORAL RESEARCH	45	I, II

VETERINARY BIOCHEMISTRY

Course Contents

VBC 601 **CHEMISTRY OF ANIMAL CELL** **2+0** **SEM - I**

Objective

Teaching of principles of physical chemistry as applicable to veterinary sciences.

Theory

UNIT-I: Pre-biotic world, chemical evolution. cellular architecture, molecular organization and metabolic function.

UNIT-II: Thermodynamics, chemical equilibrium, standard state, living cell as steady state, open system obeying laws of thermodynamics. Minimum energy conformation, quantum mechanical calculation. ΔG and ATP.

UNIT-III: Properties of water, homeostasis, pH, osmosis, viscosity, surface forces, adsorption, dialysis, diffusion rate and the sizes of organisms. The blood buffering system. Chemical basis of oral and parental fluid/electrolyte therapies, Bacterial toxigenic diarrhoeas.

Suggested Readings

Chang 2005. *Physical Chemistry for the Bioscience*. Univ. Science Books.

Dvorak AM & Harris W. 1991. *Blood Cell Biochemistry*. 2nd Ed. Plenum.

Garby L. 1995. *Bioenergetics*. Cambridge.

Voet D, Voet JG & Pratt CW. 2006. *Fundamentals of Biochemistry of Life at the Molecular Level*. 2nd Ed. John Wiley & Sons.

VBC 602 **TECHNIQUES IN BIOCHEMISTRY** **0+2** **SEM - I, II**

Objective

To make students well versed with methodologies used in biochemistry.

Practical

Solving problems using Henderson–Hasselbalch equation, pH, pKa and buffer concentration, normality. Application of colorimetry, spectrophotometry and NMR-X ray crystallography.

Paper, column and thin layer chromatography. Partition and adsorption co- efficient, quantitative and qualitative chromatography of amino acids, lipids and sugars including elution. Gas chromatography. Packing of column and choice of detectors and densitometry.

Application of electrophoresis. Electrophoresis of proteins and nucleic acids. Use of sodium dodecyl sulfate and molecular weight determination. Densitometry procedures and quantitative assays. Immunoelectrophoresis and its applications. Isoelectrofocussing and isotacophoresis. Molecular sieving and its application in Biochemistry. General properties of dextran, acrylamide, agar and other media used for gel filtration.

Ultracentrifugation– its principle and use, preparative analytical and density gradient ultracentrifugation. Fractionation of sub-cellular components and molecular weight determination using ultracentrifuge.

Suggested Readings

David L Nelson & Cox Michael M. 2007. *Lehninger's Principles of Biochemistry*. 4th Ed. Freeman.

Garrity S. 1999. *Experimental Biochemistry*. 3rd Ed. Academic Press.

Gowenlock AH. 1996. *Varley's Practical Clinical Biochemistry*. 6th Ed. CBS.

Holme DJ & Hazel P. 1983. *Analytical Biochemistry*. Longman.

VBC 603 **APPLICATIONS OF GENOMICS AND** **2+0** **SEM - II**
PROTEOMICS IN MOLECULAR BIOLOGY

Objective

To acquaint students about molecular basis of structure and functional aspects of NA and AA.

Theory

UNIT-I: Nucleotides, nucleic acids, high order structures, cohesions and condensins in chromosome structure. SMC proteins, sequencing, mutation, evolution. DNA libraries. Bacterial RNA polymerase, RNA interference. DNA replication, RNA synthesis, control

of gene expression. DNA microarrays/chips.

UNIT-II: PCR, Recombinant DNA technology in improving domestic animals. RFLP, Gene and gene products. Genetic changes in hereditary diseases, cancer and detection ion DNA probes. Gene Therapy DNA vaccines, anti-tumor antibodies. Telomerases and Topoisomerases in treatment of diseases. *Staphylococcus* resistance to erythromycin.

UNIT-III: Peptide bonds, acid-base properties, stereochemistry, side chain modifications, biological activities. Green fluorescent protein. Polypeptide diversity, protein purification

and analysis, protein sequencing, reconstructing the sequence. Gene duplication and protein families, protein modules, combinatorial peptide libraries folding. Structural bio-informatics. Protein structure prediction and design. Proteomics. Drug molecules, myoglobin and haemoglobin. Mechanism and co-operativity in Hb. High altitude adaptation in ruminants and equines. Use of amino acid analysis in disease diagnosis.

Suggested Readings

David L Nelson & Cox Michael M. 2007. *Lehninger's Principles of Biochemistry*. 4th Ed. Freeman.

Murray RK, Granner DK, Mayes PA & Rodwell, VK. 2000. *Harper's Biochemistry*. Lange Medical Book.

Voet D, Voet JG & Pratt CW. 2006. *Fundamentals of Biochemistry of Life at the Molecular Level*. 2nd Ed. John Wiley & Sons.

VBC 604 BIOCHEMISTRY OF BIOMOLECULES: 2+0 SEM - I **CARBOHYDRATES, LIPIDS AND MEMBRANE** **STRUCTURE**

Objective

Teaching of molecular basis of structure and functional aspects of carbohydrates and lipids.

Theory

UNIT-I: Carbohydrates: Structure, glycoconjugates in cell surface, extra cellular matrix, sugar code functions, peptidoglycan-specific antibiotics. Cellular effects of Insulin, Glucose supply and removal, Ruminal fermentation, role of liver, glucose tolerance, indirect monitoring of blood glucose, ketone bodies.

UNIT-II: Lipid classification, metabolism of LCFA, TAG, PL, Sphingolipids, cholesterol, lipoproteins. Regulation of lipid metabolism in fed and fasted states. Regulation of FA oxidation. FAs as regulatory molecules. Glucose production and FAs in type II diabetes. Ketone bodies as fuel.

UNIT-III: Lipid bilayers, lipid motility, integral membrane proteins, lipid linked proteins, peripheral membrane proteins, fluid mosaic model, membrane skeleton, lipid asymmetry, vesicle trafficking, secretory pathway, membrane rafts, caveolae fusion, lung surfactant, structure of bacterial rhodopsin. thermodynamics of membrane transport, ionophores, porins, ion channels, aquaporins, transport proteins, P and F types (Na⁺ - K⁺) ATPases, Ca²⁺, Ion-gradient, Gap Junction, Cl⁻-HCO₃⁻-exchanger, cardiac glycosides, abnormalities in cell membrane fluidity. Haemolytic anaemia.

Suggested Readings

Combs GF. 1992. *The Vitamins-Fundamental Aspects in Nutrition and Health*. Academic Press.

David L Nelson & Cox Michael M. 2007. *Lehninger's Principles of Biochemistry*. 4th Ed. Freeman.

Kaneko JJ, Harvey JH & Bruss ML. 1999. *Clinical Biochemistry of Domestic Animals*. 5th Ed. Academic Press.

VBC 605 ENZYME CATALYSIS, KINETICS, 2+0 SEM - II **INHIBITION AND REGULATION**

Objective

To give thorough knowledge of molecular basis of enzyme action in relation to diagnostic importance.

Theory

UNIT-I: Mechanisms: Enzyme activation energy and reaction co-ordination, acid- base, covalent, metal ion. Proximity and orientation effects. Preferential transitional state

binding.

UNIT-II: Chemical kinetics, enzyme kinetics, kinetic data analysis, bisubstrate reactions. Competitive, Uncompetitive, Mixed inhibitors. Allosteric regulation. Drug design, drug discovery, bioavailability and toxicity, clinical trials. Cytochrome P450 and adverse drug reactions; synthesis of bacterial peptidoglycans, oxygenases, mixed function oxidases. Enzyme linked diagnostics.

UNIT-III: Lysozyme. Serine proteases, physiology and tumor cell metastasis. Nerve poisons, blood coagulation cascade, Equine immuno-deficiency enzyme inhibitors. Suicide activators (DFMO for inhibition of ornithine decarboxylases in trypanosomiasis).

Suggested Readings

David L Nelson & Cox Michael M. 2007. *Lehninger's Principles of Biochemistry*. 4th Ed. Freeman.

Hang C & Wang T. 1988. *Enzyme Dynamics and Regulation*. Springer- Verlag.

Voet D, Voet JG & Pratt CW. 2006. *Fundamentals of Biochemistry of Life at the Molecular Level*. 2nd Ed. John Wiley & Sons.

VBC 606 METABOLISM-I: CARBOHYDRATES AND 2+0 SEM - I LIPIDS

Objective

To teach regulatory mechanisms of carbohydrates and lipids metabolism in health and diseases.

Theory

UNIT-I: Metabolic control, analysis for enzymes limiting the flux through a pathway. Trophic strategies, universal mapping of metabolic pathways. Thermodynamic relationships. ΔG , ATP and phosphoryl group transfer, coupled reactions, thioesters, NAD⁺ and FAD.

UNIT-II: Overview of carbohydrate, and lipid cycles, control of glycolysis, glycolysis in cancer cells, control of pentose phosphate pathways, deficiency of glucose-6-phosphate dehydrogenase. Control of glycogen metabolism, control of gluconeogenesis. GSD. Regulation of citric acid cycle, pathways that use citric acid intermediates, Sugar interconversions and nucleotide- linked sugar formation. Disorders associated with impairment of metabolism.

UNIT-III: Electron transport and oxidative phosphorylation. Generation of heat by uncoupling in brown adipose tissue.

UNIT-IV: Regulation of fatty acid metabolism, inhibitors of fatty acids biosynthesis, sphingolipid degradation and lipid storage disease. Regulation of cholesterol synthesis. PGs in NSAID, leukotrienes, HETEs, hypersensitivity. Influence of glucose metabolism on lipid metabolism.

Suggested Readings

David L Nelson & Cox Michael M. 2007. *Lehninger's Principles of Biochemistry*. 4th Ed. Freeman.

Glaser JA & Deutscher MP. 1995. *Introduction to Biophysical Methods for Protein and Nucleic Acid Research*. Academic Press.

Russell TR, Brew K, Faber H & Schultz J. 2001. *From Gene to Protein: Information Transfer in Normal and Abnormal Cells*. Miami Winter Symposium-16. Academic Press.

Voet D, Voet JG & Pratt CW. 2006. *Fundamentals of Biochemistry of Life at the Molecular Level*. 2nd Ed. John Wiley & Sons.

VBC 607 METABOLISM - II: NUCLEIC ACIDS AND 2+0 SEM - I AMINO ACIDS

Objective

To understand regulatory mechanisms of amino acid and nucleic acid metabolism in health and diseases.

Theory

UNIT-I: Overview of pathways of amino acid and nucleic acid metabolism. Lysosomal degradation, ubiquitin, proteasome, breakdown of amino acids, heme biosynthesis and degradation, biosynthesis of physiologically active amines. Nitric oxide, homocystein as marker of disease. Diseases of amino acid metabolism, porphyrias.

UNIT-II: Nucleotide synthesis and degradation, inhibition of thymidylate synthesis in

cancer therapy. Mutation in coenzyme binding sites and diseases. Forces stabilizing NA structure, restriction endonucleases, small inhibitory RNAs. Chromatin organization. Inhibitors of topoisomerases as antibiotic and anti-cancer agents, interfering with purine and pyrimidine metabolism.

UNIT-III: Viral nucleic acids, DNA damage and repair, telomerase, ageing and cancer. Topoisomerases as drug targets. Chemotherapy can target precursors of DNA synthesis. Antibiotics and toxins that target RNA polymerase. Lysosomal enzymes, gout, diseases in purine and pyrimidine nucleotide metabolic impairment.

Suggested Readings

- David L Nelson & Cox Michael M. 2007. *Lehninger's Principles of Biochemistry*. 4th Ed. Freeman.
- Kaneko JJ, Harvey JH & Bruss ML. 1999. *Clinical Biochemistry of Domestic Animals*. 5th Ed. Academic Press.
- Swenson MJ & Reece WO. 1996. *Dukes' Physiology of Domestic Animals*. 11th Ed. Panima.
- Voet D, Voet JG & Pratt CW. 2006. *Fundamentals of Biochemistry of Life at the Molecular Level*. 2nd Ed. John Wiley & Sons.

VBC 608 METABOLISM – III: INTEGRATION AND 2+0 SEM - II
REGULATION

Objective

To give exposure in inter-relationship of cellular metabolism of various macromolecules.

Theory

UNIT-I: Regulation and integration of all metabolic pathways.

UNIT-II: Organ specialization in fuel metabolism : Brain, muscle, adipose tissue, liver, kidney, inter organ metabolic pathways, hormonal control of fuel metabolism. Tracing metabolic fates, perturbing the system.

UNIT-III: Signal transduction, gated ion channels, G-proteins, adenylate cyclase, receptor tyrosine kinase, protein phosphatases, cGMP, Ca²⁺, interaction with phosphoserine/tyrosine, integrations, drugs and toxins, cell cycle and CDKs that affect cell signaling.

UNIT-IV: Oncogenes and cancers. Mitochondrial genes and diseases. Reactive oxygen species. Cyanide and arsenic poisoning. Metabolic inter- relationships in obesity, diabetes, cancer, aerobic and anaerobic exercise in horses, pregnancy, lactation and stress injury. Mitochondria in apoptosis and oxidative stress. Cell suicide, liver diseases, renal diseases, acid-base balance. Metabolic/sensory transduction in nervous tissue. Vision. Blood coagulation.

Suggested Readings

- Kaneko JJ, Harvey JH & Bruss ML. 1999. *Clinical Biochemistry of Domestic Animals*. 5th Ed. Academic Press.
- Kurjan J & Taylor BL. 1993. *Signal Transduction*. Academic Press.
- Voet D, Voet JG & Pratt CW. 2006. *Fundamentals of Biochemistry of Life at the Molecular Level*. 2nd Ed. John Wiley & Sons.

VBC 609 CENTRAL DOGMA AND PROTEIN 2+0 SEM - I
FUNCTION

Objective

Teaching of applied aspects of replication, transcription and translation.

Theory

UNIT-I: Overview of transcription and translation in eukaryotes. Collision between DNA polymerase and RNA polymerase, inhibitors of transcription, introns, evolution and expansion of the genetic code.

UNIT-II: The effects of antibiotics and toxins on protein synthesis. X – chromosome inactivation. Eukaryotic gene expression, protein targeting.

UNIT-III: Actin structure, microfilament dynamics, actin-myosin reacting cycle, tubulin dimer, microtubules dynamics, kinesins, dyneins.

UNIT-IV: Antigen-antibody binding, cytokines, principles of immunochemical methods: agglutination, precipitation, typing of major histo-compatibility antigens. Blood group substances in farm animals.

UNIT-V: Proteins as infectious agents (prions – BSE). Protein misfolding and aggregation. Plasma proteins, synthesis, functions. Influences of physiological factors and inflammation on proteins. Dysproteinemias. Defects in collagen synthesis. Transmissible multiple drug resistance, transcription factors and cardiovascular diseases. Transferrin, Lactoferrin, Ferritin and Ceruloplasmin.

Suggested Readings

Creighton TE. 1993. *Protein Structures and Molecular Properties*. WH Freeman.
David L Nelson & Cox Michael M. 2007. *Lehninger's Principles of Biochemistry*. 4th Ed. Freeman.
Voet D, Voet JG & Pratt CW. 2006. *Fundamentals of Biochemistry of Life at the Molecular Level*. 2nd Ed. John Wiley & Sons.

VBC 610 CLINICAL BIOCHEMISTRY OF ANIMALS 2+1 SEM - I

Objective

To make a student well versed with biochemical basis for diagnosis and prognosis of diseases in animals and poultry.

Theory

UNIT-I: Disturbances of gastro-intestinal function, disturbances of rumen function. Lactic acidosis, Pickled pigs and malignant hyperthermia. Diagnosis of neuromuscular disorders.

UNIT-II: Myocardial infarction, respiratory distress syndrome. Primary renal dysfunctions and test, doping. Problems in game horses.

UNIT-III: Enzymes of diagnostic importance. Toxicity of ammonia in animals. Genetic defects in urea cycle. Lysosomal storage diseases. ATP synthase inhibitory protein during ischemia. Ischaemic – reperfusion injury.

UNIT-IV: Molecular oncology and tumor markers. CSF characteristics in diseases. Clinical biochemistry in toxicology. Glycosylated hemoglobin, HbA1c, fructosamine. Deranged glucose metabolism in cancerous tissue. Free Radical damage.

Practical

Estimation of constituents (enzymes, metabolites and electrolytes) of body fluids during normal and pathological conditions. Estimation of hormones. Liver and kidney function tests. Total volatile fatty acids and the fractions in ruminants.

Suggested Readings

Devlin 2005. *Textbook of Medical Biochemistry with Clinical Correlations*. Wiley Liss.
Jurisica I & Wigle D. 2006. *Knowledge and Discovery in Proteomics*. CRC.
Kaneko JJ, Harvey JH & Bruss ML. 1999. *Clinical Biochemistry of Domestic Animals*. 5th Ed. Academic Press.
Liebler DL. 2002. *Introduction to Proteomics*. Humana Press.
Pryor WA. 1996. *Free Radicals in Biology*. Academic Press.
Searcy RL. 1969. *Diagnostic Biochemistry*. McGraw-Hill.

VBC 611 BIOCHEMICAL BASIS OF DISEASES OF 2+0 SEM - II
DOMESTIC ANIMALS

Objective

To give a detailed overview of role of biomolecules in health and diseases in animals and poultry.

Theory

UNIT-I: Diabetes mellitus, hyperinsulemia, galactosemia, hypoglycaemia of baby pigs, Glycogen Storage Disease. Carbohydrate balance in ruminants. Biochemical alterations in body fluids of ruminants in hypoglycaemia, Ruminant ketosis.

UNIT-II: Hypercholesterolemia, atherosclerosis, hyperlipidemia in canine, feline, equine. Pathophysiology of ketonemia. Ketosis associated with fasting, diabetes, pregnancy, lactation and post exercise.

UNIT-III: Anemias of the newborn, cytosolic enzyme deficiencies and membrane abnormalities in erythrocytes. Porphyrins and porphyrias. Disorders of iron metabolism, neutrophil function defects and its testing. Equine immuno- deficiency.

UNIT-IV: Hepatic insufficiencies and its laboratory assessment. Pancreatitis and insufficiency. Metabolic diseases of Ca, P, Mg metabolism. Iron overload and injection, inorganic polyphosphate metabolism.

UNIT-II: Metabolic disorders of rumen and recent development in disorders of ruminants associated with protein, carbohydrate and fat metabolism.

UNIT-III: Recent development in disorders of ruminants associated with mineral and electrolyte metabolism.

Suggested Readings

Selected articles from journals.

VBC 702 ADVANCES IN ENZYMOLOGY 2+0 SEM - II

Objective

To teach current developments in actions of enzymes.

Theory

UNIT-I: Current concept on how enzymes work.

UNIT-II: Recent innovations in enzymes kinetics to understand mechanism.

UNIT-III: Current topics on regulatory enzymes.

UNIT-IV: Lysozymes, serine proteases, drug design.

Suggested Readings

Selected articles from journals.

VBC 703 ADVANCES IN CLINICAL 0+2 SEM - II
BIOCHEMISTRY

Objective

To educate students about current developments in clinical biochemistry.

Theory

UNIT-I: Scope of clinical biochemistry and its application in disease diagnosis.

UNIT-II: Molecular basis of cell injury and diseases.

UNIT-III: Molecular basis of autoimmunity, immunodeficiency, oncogenesis.

UNIT-IV: Functional tests : DNA finger printing, micro and mini satellites, PCR-RFLP in clinical biochemistry, DNA microarrays. Biomolecular prospecting and molecular designing.

Practical

Nucleic acid extraction, protein arrays, RT-PCR, hybridization, electrophoretogram and chromatogram of macromolecules.

Suggested Readings

Selected articles from journals.

VBC 704 MEMBRANE DYNAMICS AND SIGNAL 2+0 SEM - I
TRANSDUCTION IN ANIMAL CELL

Objective

Discussions on recent developments in membrane function.

Theory

UNIT-I: Developments in physical & chemical features of biological transport.

UNIT-II: Developments in membrane dynamics.

UNIT-III: Developments in solute transport across membrane.

UNIT-IV: Developments in molecular mechanisms of signal transduction, regulation by steroid hormone, protein kinases.

UNIT-V: Developments in signaling in microorganisms, special senses.

Suggested Readings

Selected articles from journals.

VBC 705 METHODS IN PROTEIN ANALYSIS 2+1 SEM - I

Objective

Discussions on contemporary information on techniques in protein research.

Theory

UNIT-I: Separation, purification and characterization of proteins in ECF and membrane.

UNIT-II: Subcellular organization of proteins fused with green fluorescent protein. High throughput methodologies for determining protein structure. Investigating protein with mass spectrometry. Method of determining three dimensional structure of protein. Use of atomic force microscopy in visualizing protein complexes and membrane surfaces.

UNIT-III: Use of FRET (fluorescence resonance energy transfer) to measure transient changes in second messenger or protein kinase activity in living cell. Proteomics.

Practical

Proteomics, protein quantification.

Suggested Readings

Selected articles from journals.

VBC 706 NUTRITIONAL BIOCHEMISTRY 2+0 SEM - I**Objective**

To give exposure about biochemical principle as applicable to nutrition in animals and poultry.

Theory

UNIT-I: Evolution of diet and nutritional status of animals, digestion, absorption in ruminants, equine and poultry.

UNIT-II: Calorimetry, BMR, SDA, PER, nutritional need for growth, work, production and disease. Parental nutrition.

UNIT-III: Obesity, food additives and naturally occurring toxic substances in food, dietary factors in carcinogenesis, free radical, antioxidant and pro-oxidant.

Suggested Readings

Selected articles from journals.

VBC 707 ADVANCES IN INTERMEDIARY 2+0 SEM - I
METABOLISM**Objective**

To teach methods and approaches in research on metabolism.

Theory

UNIT-I: Energy transformation in living cell, enzymes system, high energy compounds.

UNIT-II: Overview of cycles, role of TCA in producing biological precursor in evolution. Control of fatty acid metabolism, lipoprotein metabolism, pathways of amino acids, integration of cycles, metabolism of purines, pyrimidines. CoA, NAD⁺, FAD⁺ and ATP.

UNIT-III: Analytical approaches in studies on intermediary metabolism.

Suggested Readings

Selected articles from journals.

VBC 708 ENDOCRINE CONTROL OF FUEL 2+0 SEM - II
METABOLISM**Objective**

To study hormonal regulation and integration of mammalian metabolism.

Theory

UNIT-I: Hormone: Diverse structure for diverse functions.

UNIT-II: Tissue specific metabolism.

UNIT-III: Hormonal regulation of fuel metabolism. ‘

UNIT-IV: Regulation of body mass, production of beef, egg, poultry and fish.

Suggested Readings

Selected articles from journals.

VBC 709 DIAGNOSTIC ENZYMOLOGY - I 2+0 SEM - I**Objective**

To expose students about use of enzymes in diagnostics.

Theory

UNIT-I: History, development, validation of clinical enzyme assay.

UNIT-II: Assay of enzymes in clinical cases. Enzymuria. Enzymes in pathogenesis.

UNIT-III: Enzyme histochemistry and cytochemistry, immobilized enzymes. Enzyme immuno diagnostics, molecular genetics.

Suggested Readings

Selected articles from journals.

VBC 710 DIAGNOSTIC ENZYMOLOGY - II 2+0 SEM - II**Objective**

To provide in-depth knowledge about enzymes in diagnosis of diseases of animals and poultry.

VETERINARY BIOCHEMISTRY

List of Journals

- Indian Journal of Chemical Technology
- Indian Journal of Biochemistry and Biophysics
- Indian Journal of Chemistry - Section B
- Indian Veterinary Journal
- Journal of Chemical Sciences
- Journal of Indian Chemical Society
- Meat Science - An International Journal
- The EMBO Journal
- Theriogenology
- Trends in Biochemical Sciences

e-Resources

- www.niscair.res.in/ScienceCommunication (Indian Journal of Biochemistry)
- www.medind.nic.in/iaf/iafm.shtml (Indian Journal of Clinical Biochemistry)
- www.ijcb.co.in (Indian Journal of Clinical Biochemistry)
- www.mcponline.org (Molecular & Cellular Proteomics)
- www.elsevier.com/vj/proteomics (Proteomics Virtual Journal)
- www.elsevier.com (Journal of Proteomics)
- www.elsevier.com (Clinical Biochemistry)
- www.sciencedirect.com/science/journal (Science Direct –Clinical Biochemistry)
- www.jbc.org (Journal of Biological Chemistry)

Suggested Broad Topics for Master's and Doctoral Research

- Biochemical parameters in body fluids of patients in livestock and poultry
- Assay of enzymes for diagnosis of diseases in poultry and livestock.
- Endocrine studies on domestic and companion animals in relation to production and health status