

VETERINARY PHARMACOLOGY AND TOXICOLOGY

Course Structure – at a Glance

CODE	COURSE TITLE	CREDITS
VPT 601	GENERAL PHARMACOLOGY	2+0
VPT 602	AUTONOMIC AND AUTACOID PHARMACOLOGY	2+1
VPT 603	CNS PHARMACOLOGY	2+1
VPT 604	DIGESTIVE AND RESPIRATORY PHARMACOLOGY	2+0
VPT 605	CARDIOVASCULAR AND RENAL PHARMACOLOGY	2+0
VPT 606	ENDOCRINE AND REPRODUCTIVE PHARMACOLOGY	2+0
VPT 607	CHEMOTHERAPY	2+1
VPT 608	TOXICOLOGY OF XENOBIOTICS	2+1
VPT 609	TOXICOLOGY OF PLANTS AND TOXINS	2+0
VPT 610	PHARMACOLOGICAL TECHNIQUES	1+1
VPT 611	TECHNIQUES IN TOXICOLOGY	1+1
VPT 612	ETHNOPHARMACOLOGY	2+0
VPT 691	MASTER'S SEMINAR	1+0
VPT 699	MASTER'S RESEARCH	20
VPT 701	ADVANCES IN NEUROPHARMACOLOGY	2+0
VPT 702	AUTACOID PHARMACOLOGY	1+0
VPT 703	PHARMACOLOGY OF HERBAL DRUGS	2+1
VPT 704	DRUG METABOLISM	2+0
VPT 705	MOLECULAR PHARMACOLOGY	2+0
VPT 706	PHARMACOKINETICS	2+1
VPT 707	PHARMACOGENOMICS	2+0
VPT 708	IMMUNOPHARMACOLOGY	1+0
VPT 709	MOLECULAR TOXICOLOGY	2+0
VPT 710	CLINICAL PHARMACOLOGY	1+1
VPT 711	CLINICAL TOXICOLOGY	2+1
VPT 712	ECOTOXICOLOGY	2+0
VPT 713	REGULATORY TOXICOLOGY	2+1
VPT 790	SPECIAL PROBLEM	0+2
VPT 791	DOCTORAL SEMINAR I	1+0
VPT 792	DOCTORAL SEMINAR II	1+0
VPT 799	DOCTORAL RESEARCH	45

VETERINARY PHARMACOLOGY AND TOXICOLOGY

Course Contents

VPT 601	GENERAL PHARMACOLOGY	2+0
Objective	To study the scope of pharmacology and to understand the basic mechanisms of drug actions and its effects.	
Theory	<u>UNIT I</u> History and scope of pharmacology, Principles of drug absorption, distribution, metabolism and elimination. Drug bioavailability and routes of administration. <u>UNIT II</u> Important pharmacokinetic parameters and their clinical significance. <u>UNIT III</u> Pharmacodynamics: mechanism of action and the relationship between drug concentration and effect; signal transduction mechanism and drug receptors for physiological regulatory molecules. <u>UNIT IV</u> Quantitation of drug-receptor interactions and elicited effects. Competitive and non-competitive antagonism. Factors affecting drug response. Adverse drug reactions.	
Suggested Readings	Brunton LL. (Ed). 2005. <i>Goodman and Gilman's The Pharmacological Basis of Therapeutics</i> . 11 th Ed. McGraw-Hill. Richard AH. (Ed). 2001. <i>Veterinary Pharmacology and Therapeutics</i> . 8 th Ed. Iowa State Univ. Press. Sandhu HS & Rampal S. 2006. <i>Essentials of Veterinary Pharmacology and Therapeutics</i> . 1 st Ed. Kalyani Publishers.	
VPT 602	AUTONOMIC AND AUTACOID PHARMACOLOGY	2+1
Objective	To study the pharmacodynamics of autonomic drugs.	
Theory	<u>UNIT I</u> Anatomical and physiological considerations of autonomic nervous system (ANS). <u>UNIT II</u> Neurohumoral transmission in ANS. <u>UNIT III</u> Pharmacology of cholinergic agonists and antagonists. <u>UNIT IV</u> Pharmacology of adrenergic agonists and antagonists. <u>UNIT V</u> Ganglionic stimulants and blockers. <u>UNIT VI</u> Autacoids: Histamine, serotonin, kinins, eicosanoids and platelet activating factor.	

Practical

Pharmacological experiments on intact and isolated preparations for studying the effects of various prototype drugs on vascular, intestinal, respiratory, urinary and reproductive smooth muscles, autonomic ganglia, skeletal muscles; blood pressure, ECG, heart etc.

Suggested Readings

Brunton LL. (Ed). 2005. *Goodman and Gilman's The Pharmacological Basis of Therapeutics*. 11th Ed. McGraw-Hill.

Richard AH. (Ed). 2001. *Veterinary Pharmacology and Therapeutics*. 8th Ed. Iowa State Univ. Press.

Sandhu HS & Rampal S. 2006. *Essentials of Veterinary Pharmacology and Therapeutics*. 1st Ed. Kalyani Publishers.

VPT 603

CNS PHARMACOLOGY

2+1

Objective

To study the pharmacodynamics of drugs acting on CNS.

Theory

UNIT I

Anatomical and physiological considerations of central nervous system (CNS); neurohumoral transmission in CNS.

UNIT II

Historical development, theories, principles and stages of general anaesthesia.

UNIT III

Pharmacology of anaesthetics, sedatives, hypnotics, neuroleptics, antiepileptics.

UNIT IV

CNS stimulants, analeptics, opioid agonists and antagonists; non-steroidal anti-inflammatory agents, central and peripheral muscle relaxants, local anaesthetics, therapeutic gases. euthanizing agents. Doping.

Practical

Study of pharmacodynamics of prototype drugs of each group in experimental animals.

Suggested Readings

Brunton LL. (Ed). 2005. *Goodman and Gilman's The Pharmacological Basis of Therapeutics*. 11th Ed. McGraw-Hill.

Richard AH. (Ed). 2001. *Veterinary Pharmacology and Therapeutics*. 8th Ed. Iowa State Univ. Press.

Sandhu HS & Rampal S. 2006. *Essentials of Veterinary Pharmacology and Therapeutics*. 1st Ed. Kalyani Publishers.

VPT 604

DIGESTIVE AND RESPIRATORY PHARMACOLOGY

2+0

Objective

To study the pharmacological aspects of drugs acting on digestive and respiratory systems.

Theory

UNIT I

Pharmacology of drugs acting on gastrointestinal tract. Appetite stimulants, emetics and anti-emetics.

trimethoprim and nitrofurans in biological fluids to study their kinetics and bioavailability.

Suggested Readings

- Brunton LL. (Ed). 2005. *Goodman and Gilman's The Pharmacological Basis of Therapeutics*. 11th Ed. McGraw-Hill.
- Richard AH. (Ed). 2001. *Veterinary Pharmacology and Therapeutics*. 8th Ed. Iowa State Univ. Press.
- Sandhu HS & Rampal S. 2006. *Essentials of Veterinary Pharmacology and Therapeutics*. 1st Ed. Kalyani Publishers.

VPT 608 TOXICOLOGY OF XENOBIOTICS 2+1

Objective

To study the poisonings and their antidotal therapy in animals.

Theory

UNIT I

Principles and scope of toxicology, sources of poisoning.

UNIT II

General modes of action of poisons, detoxification, factors affecting toxicity, general principles of diagnosis and treatment of poisonings.

UNIT III

Toxicology of metals, agrochemicals, solvents and vapors, feed additives.

UNIT IV

Toxic effects of radiations and radioactive chemicals, genetic and developmental toxicology; forensic and regulatory aspects of toxicology.

Practical

Extraction, separation and detection of common poisons in toxicological specimens, study of toxicity and antidotal treatment in animals, designing of animal toxicity experiments and general toxicity tests.

Suggested Readings

- Klassen CD, Amdure MO & Doull J. (Eds). 1996. *Casarett & Doull's Toxicology: The Basic Sciences of Poisons*. 5th Ed. McGraw Hill.
- Sandhu HS & Brar RS. 2000. *Text Book of Veterinary Toxicology*. 1st Ed. Kalyani Publishers.
- Stive KE & Brown TM. 2006. *Principles of Toxicology*. 2nd Ed. CRC Press.

VPT 609 TOXICOLOGY OF PLANTS AND TOXINS 2+0

Objective

To impart knowledge of toxicity of poisonous plants & natural toxins.

Theory

UNIT I

Classification, identification and chemical constituents of poisonous plants. Plants containing cyanide, nitrate/nitrite, oxalate, lectins and cardiotoxic glycosides.

UNIT II

Plants producing lathyrism, thiamine deficiency and photosensitization.

UNIT III

Toxicology of mycotoxins: aflatoxins, rubratoxins, ochratoxins, trichothecenes, tremorgens and ergot.

UNIT IV

Animal bites and stings: snake venom, scorpion, spider and insect stings and toad poisoning. Bacterial toxins: botulism.

Suggested Readings

- Chopra SR, Badhwar RL & Ghosh S. 1984. *Poisonous Plants of India*. 1st Ed., Academic Publishers, Jaipur.
- Klassen CD, Amdure MO & Doull J. (Eds). 1996. *Casarett & Doull's Toxicology: Basic Sciences of Poisons*. 5th Ed., McGraw Hill.
- Sandhu HS and Brar RS. 2000. *Text Book of Veterinary Toxicology*. 1st Ed., Kalyani Publishers.

VPT 610

PHARMACOLOGICAL TECHNIQUES

1+1

Objective

To impart the knowledge of various basic pharmacological techniques and screening methods of drugs.

Theory

UNIT I

Principles of drug action and bioassay. Dose response curves and their analysis.

UNIT II

Techniques for setting up isolated and intact preparations.

UNIT III

Organization of screening programme of drugs; multidimensional screening procedures and gross observational methods.

Practical

Setting up of isolated and intact preparations, recording of BP in dog/rat, recording of ECG in rat, experiments on drug potentiation, antagonism and tachyphylaxis. Construction of dose-response plots, calculation of EC₅₀, dissociation rate constants, potency ratio, pA_x, pD_x and pD'_x values.

Specific tests for evaluation of tranquilizing, hypnotic, analgesic, anti-convulsant, general and local anesthetic, muscle relaxant, anti-inflammatory, antipyretic, antiarrhythmic, antihypertensive, antihyperglycemic and anticholesterimic activities. Determination of potency ratio, median effective, toxic or lethal doses. Bioassay techniques.

Suggested Readings

- Ghosh MN. (Ed). 2005. *Fundamentals of Experimental Pharmacology*. 3rd Ed. Hilton & Co.
- Kulkarni SK (Ed). 2004. *Handbook of Experimental Pharmacology*. 3rd Ed. Vallabh Prakashan.
- Laurance DR & Bacharach AL. (Ed). 1964. *Evaluation of Drug Activities: Pharmacometrics*. Vols. I, II. Academic Press.
- Parmar NS & Shiv Prakash 2006. *Screening Methods in Pharmacology*. 1st Ed. Narosa.
- Seth UK, Dadkar NK & Usha G Kamat (Eds). 1972. *Selected Topics in Experimental Pharmacology*. 1st Ed. Kothari Book Depot.
- Tallarida RJ & Murray RB. 1987. *Manual of Pharmacologic Calculations*. 2nd Ed. Springer Verlag.

Suggested Readings

Selected articles from journals.

VPT 703 PHARMACOLOGY OF HERBAL DRUGS 2+1

Objective

To study the pharmacological, therapeutic and toxicological aspects of potential medicinal plants and herbal drugs.

Theory

UNIT I

Historical aspect, chemical constituents of medicinal plants and their classification.

UNIT II

Identification, collection, preservation, purification, isolation, standardization and clinical validation of bioactive molecules from vegetable sources.

UNIT III

Characterization of pharmacological, therapeutic and toxic effects of potential herbal drugs.

UNIT IV

Strategies for development of herbal drugs.

Practical

Extraction, detection, isolation and purifications of active chemical constituents from plant sources. Pharmacological effects of herbal drugs on intact and isolated preparations.

Suggested Readings

Selected articles from journals.

VPT 704 DRUG METABOLISM 2+0

Objective

To study the mechanisms and processes of drug biotransformation.

Theory

UNIT I

Mechanisms and processes of drug biotransformation.

UNIT II

Synthetic and non-synthetic pathways of drug metabolism.

UNIT III

Chemical, biological, genetic and environmental factors. Species variations affecting drug biotransformation mechanisms.

UNIT IV

Hepatic microsomal and non-microsomal enzyme systems.

UNIT V

Enzyme induction and inhibition.

Suggested Readings

Selected articles from journals.

VPT 705 MOLECULAR PHARMACOLOGY 2+0

Objective

To study the identification and characterization of receptors and drug receptors interactions.

Theory

UNIT I

Physicochemical properties of drugs, forces involved in binding of drugs to receptors.

UNIT II

Receptor conformation and configuration and structure activity relationship.

UNIT III

Theories of drug receptor interactions; analysis of dose response relationship and molecular mechanisms of drug actions.

UNIT IV

Methods of identification, isolation and characterization of receptors.

Suggested Readings

Selected articles from journals.

VPT 706

PHARMACOKINETICS

2+1

Objective

To study the absorption, distribution, biotransformation and excretion of drugs.

Theory

UNIT I

Routes of drug administration, factors modifying drug delivery; absorption, distribution, biotransformation and elimination.

UNIT II

Kinetics following single and multiple dosage; compartmental models of drug distribution, bioavailability, volume of distribution and protein binding of drugs.

UNIT III

Rates of absorption, distribution and elimination; absorption and elimination half-lives and rate of transfer of drugs between compartments.

UNIT IV

Renal clearance, dosage regimen; non-compartmental pharmacokinetic modeling.

UNIT V

Application of pharmacokinetic principles in therapeutics.

Practical

Analysis of pharmacokinetic data and determination of different pharmacokinetic parameters and bioavailability of drugs in normal and diseased animal models.

Suggested Readings

Selected articles from journals.

VPT 707

PHARMACOGENOMICS

2+0

Objective

To study the responses to drugs with respect to various aspects of genomics.

Theory

UNIT I

Introduction, species variations affecting drug responses, increased and decreased responsiveness to drug effects/toxicities & novel drug effects

UNIT II

Genetic polymorphism.

VPT 712	ECOTOXICOLOGY	2+0
	<p>Objectives To impart knowledge regarding ecotoxicology for conservation of healthy eco-system.</p> <p>Theory <u>UNIT I</u> Basic principles of ecotoxicology. Sources of contamination and effects of pollutants on eco-health. <u>UNIT II</u> Chemical contamination of air, water, soil and food by major agricultural and industrial chemicals – pesticides, hydrocarbons and metals. Fate of chemicals in the environment and target species. <u>UNIT III</u> Marine and wildlife as monitors of environmental quality. <u>UNIT IV</u> Contamination control and approaches to rehabilitating damaged ecosystems.</p> <p>Suggested Readings Selected articles from journals.</p>	
VPT 713	REGULATORY TOXICOLOGY	2+1
	<p>Objectives Introduction to general principles in toxicological risk assessment.</p> <p>Theory <u>UNIT I</u> Principles of risk assessment. Test protocols for toxicity studies. <u>UNIT II</u> Interaction between toxicology and industry. Compounds under regulatory legislation demands. Regulatory essential dose levels in chemical risk assessment (NOEL, NOAEL, LOEL, LOAEL & AOEL). <u>UNIT III</u> Risk assessment in practice. Classification and marking/branding of chemicals. Monitoring/surveillance of chemicals. Exposure assessment and modeling. <u>UNIT IV</u> Quality control in safety research (GLP). Operation of product register.</p> <p>Practical Good laboratory practice in toxicological research. Screening procedures in regulatory toxicology. Mandatory toxicity testing protocols. Determination of ADI, NOEL, NOAEL, LOEL, LOAEL and AOEL.</p> <p>Suggested Readings Selected articles from journals.</p>	
VPT 790	SPECIAL PROBLEM	0+2
	<p>Objective To provide expertise in handling practical research problem(s).</p> <p>Practical Short research problem(s) involving contemporary issues and research techniques.</p>	