UNDERGRADUATE PHYSIOLOGY COURSES

PHARM-201 GENERAL VETERINARY PHARMACOLOGY AND PHARMACEUTICS
3(2-1)

THEORY
Introduction to pharmacology; Historical perspectives; Scope, definitions and terminology; Drug development, drug regulations and drug sources; Classification of drugs; Transport mechanisms across biomembranes; Drug formulations; Routes of drug administration; Biodisposition of drugs; Bioavailability of drugs; Absorption of drugs; Protein binding of drugs; Distribution, storage and metabolism of drugs; Excretion of drugs; Pharmacokinetics: Principles and applications; Pharmacodynamics; Drug actions; Structure activity relationships; Receptor theories; Dose-response relationships; Therapeutic index; Drug resistance; Drug idiosyncrasy; Adverse reactions of drugs; Drug interactions; Basic principles governing the preparation and dispensing of different dosage forms.

PRACTICAL
Weights and measures; Prescription writing; Pharmaceutical calculations; Partition coefficient of drugs; Formulations; External and internal dosage forms; Techniques of drug administration in animals; Identification of various drugs; Preparation of ointments, liniments and tinctures; Experiments on drug antagonism and synergism; Drug assays; Demonstration of pharmacokinetic experiments; Demonstration of bioavailability studies.

SUGGESTED READINGS

PHARM-302 SYSTEMIC VETERINARY PHARMACOLOGY AND THERAPEUTICS
3(2-1)

THEORY
Drugs acting on central nervous system; General considerations and pre-anesthetic medication; Inhalant general anesthetics and intravenous anesthetics; Hypnotics, sedatives and analgesics; Anticonvulsants; Tranquilizers and CNS stimulants; Euthanasia; Local anesthesia; Intraspinal and epidural anesthesia; Neuromuscular-blocking agents; Autonomic drugs; Pharmacology of autacoids; Antipyretics and analgesics; Anti-inflammatory drugs; Drugs acting on gastrointestinal tract; Rumen pharmacology; Drugs acting on respiratory system; Drugs acting on urinary system; Diuretics and anti-diuretics; Drugs acting on cardiovascular system; Drugs acting on fluids and electrolyte balance; Endocrine pharmacology; Nutritional pharmacology; Drugs acting locally on skin and mucous membranes; Drugs acting locally on eyes and ears; Use of drugs in poultry; Use of drugs in fish; Use of drugs in zoo animals.

PRACTICAL
Effect of autonomic drugs on isolated heart and intestine of rabbit or guinea pigs; Effect of drug on intestinal motility in situ; Effect of autonomic drugs on eyes of rabbit; Rat hind quarter preparation for demonstration of vasodilating effects; Diuretic and anti-diuretic drug action demonstration in sheep or goat; Demonstration of drug effects on respiration in dog; Demonstration of drug effects on blood
pressure in dog; Demonstration of techniques of volatile and intravenous anesthetics; Pre-anesthetic medication; Demonstration of epidural anesthesia in dog, buffaloes, cows, sheep/goat; Conduction plexus anesthesia in frog; Infiltration, surface and intraspinal anesthesia in rabbits.

SUGGESTED READINGS

PHARM-304 VETERINARY TOXICOLOGY AND CHEMOTHERAPY 2(1-1)

THEORY
Toxicology concepts and general considerations; Factors affecting toxicity; Spectrum of toxic dose and LD₅₀ calculations; General mechanisms of toxicity; Toxicity testing; Diagnosis and treatment of poisonings; Chemotherapy of microbial, fungal and viral diseases. Beta lactam antibiotics; Aminoglycosides; Macrolides; Lincosamides; Tetracylines; Chloramphenicol; Nitrofurans; Quinolones; Sulfonamides and combinations with trimethoprim.

PRACTICAL
Tests for residues of antibiotics and sulphonamides; Antibiotic sensitivity tests; Microbiological assay; Tests for screening of pesticide residues in fodder; Tests for screening of nitrates toxic levels in fodder; Tests for screening of hydrocyanic acid toxic levels in fodder; Drug incompatibilities; Acute toxicity study; Strychnine poisoning in rabbits and dogs; Demonstration of the destruction of acetylcholine by cholinesterase; Study tour to pharmaceutical industry.

SUGGESTED READINGS

Postgraduate courses Pharmacology

Pharm.701 General Pharmacology 3(2-1)

Theory
Pharmacology and its branches; Pharmacognosy; Modification of chemical structure; Synthesis of new drugs; Drug development; Screening, bioassay and standardization; Tolerance; Tachyphylaxis; Cumulation; Introduction to Pharmacogenetics; Factors which modify actions and dosage of drugs; Drug allergy; Drug dependence; Monitoring of drug use, hazards of drug therapy; Drug interaction and its clinical significance; Drug residues and their veterinary and public health concerns; Biodisposition of drugs including absorption; distribution; Metabolism; Excretion.
Practicals
Purification of drugs from natural sources (aqueous extracts, methanolic extracts); Screening and bioassay procedures; Bioavailability of different dosage forms following oral; Intravenous and Intramuscular routes; Various routes of drug administration; Bioequivalence studies of various brands of drugs.

Books Recommended


Pharm. 702      Advanced Pharmacology      3(2-1)

Theory
General principles of drug action; Target for drug action, receptor proteins; Ion channels as drug targets; Control of drug expression; Receptor desensitization and tachyphylaxis; Molecular mechanism of drugs action; Receptors, drug receptor-interaction and its characterization; Consequences of interaction; Receptor isolation; Analysis of graded-dose response relationship; Structure activity relationship; Drug actions not mediated through receptor; Pharmacogenetics and drug idiosyncrasy; Drug toxicity due to impaired drug metabolism; Altered sensitivity to drugs; Abnormal distribution and responses to drugs; Drug allergy, Immunologic basis; Drug resistance; Drug tolerance and physical dependence; Mechanism of development of dependence; Therapeutic Index its Calculations and Implications.

Practical
Graded-dose response curves; Quantal dose response curves; Drug-receptors interactions of cholinergic drugs; Drug receptor interactions of anti-cholinergic drugs; Log-dose response curves of penicillines, aminoglycosides, tetracyclines, macrolides and quinolones antibiotics; Tests for predicting drug allergies.

Books Recommended


Pharm 704      Pharmacokinetics      3(2-1)
Theory

Introduction to course; Mathematical Functions; Exponents; Logarithms; Calculus; Spectrophotometric analysis; One compartment I.V. bolus, assumptions; First-order kinetics; Analysis of urine data; Metabolism and excretion; Clearance; Intravenous infusion and bolus administration; Routes of drug administration, oral, sublingual, rectal, intravenous, subcutaneous, intramuscular, inhalation, topical, differential equation, integrated equation; Calculation of bioavailability parameters; Reasons for bioequivalence requirements; In vitro dosage form testing; Development of general equation; Cpmax and Cpmin equations; Non-uniform dosing intervals; Routes of excretion, renal excretion and hemodialysis; Biliary excretion; Pulmonary excretion; Salivary excretion; Renal disease considerations; Dose adjustment; Drug distribution; Weight considerations; Protein binding interactions; Multi-Compartment Pharmacokinetic Models; Dosage calculations; Non Compartmental Analysis; Non-linear pharmacokinetic models; Scheme or diagram; Dosing approaches.

Practical

Clinical applications of pharmacokinetics; Therapeutic drug monitoring; Pediatric considerations; Geriatric considerations; Analysis of drugs by visible spectroscopy; Extraction of salicylic acid; One compartment model – IV bolus; One compartment model – IV infusion; One compartment model – Oral. Computer simulations – single dose; One compartment model-IV bolus-multiple dose; Computer simulation – multiple dose; Computer simulation – two compartment models; Pharmacokinetic simulations using MacDope.

Books Recommended


Pharm. 705 Pharmacetics 3(2-1)

Theory

Dissolution and disintegration; Types of Pharmaceutical preparations; Physical Pharmacy; Weights and measures; Calculations; Containers and closures; Labeling; Color and flavors; Solutions; Suspensions; Emulsions and creams; Oral dosage forms, ointments, pastes and jellies, suppositories and Pessaries; Sterilization practice in pharmaceutics; Sterilization of injections and other pharmaceutical products; Classification of injections; Sterility testing and aseptic techniques; Preservation of pharmaceutical products; Medicinal chemistry; Incompatibilities; Forensic Pharmacy and drug laws; Pharmacognosy.

Practical

Exercises in the preparation of different solutions, extracts, suspensions, emulsions, ointment, etc. for external and internal uses; Pyrogen test; Study of different types of incompatibilities; Formulation
of injections, sterilization, aseptic techniques and sterility testing methods; Visit to pharmaceutical Laboratories.

Books Recommended


Pharm. 706 Pharmacology of Central Nervous System 3(2-1)

Theory
General considerations about physiology and pharmacology of CNS; Categorization of CNS drugs; CNS versus peripheral drug actions; Central Nervous System depressants; Pharmacological properties, absorption, metabolism structure; Activity relationships of all CNS depressant drugs; General anesthetics; Principles of anesthesiology; Signs and stages of anesthesia; electro-encephalograph changes; Preanesthetic medications; General anesthetic agents; Pharmacological properties; Administration, metabolism and choice of anesthetics; Intravenous anesthetics (Barbiturates); Chemistry, pharmacological actions, metabolism and excretion; Uses in anesthesia; Barbiturate Poisoning; Hypnotics and sedatives; Local anesthetics; Drugs used in psychiatric disorders; Drugs for epilepsy; Psychotropic drugs; CNS stimulant drugs; Analgesics and antipyretic drugs; Drugs used as emetics and antiemetics; Narcotic analgesic; Drug dependency and tolerance.

Practical
Methods of evaluation of drugs actions on CNS; Study of stages of volatile anesthesia; Effects of premedications on the duration and intensity of general anesthesia; Hypnotics and their antidotes in rats and rabbits; Stimulants of CNS and their antidotes in rats and mice; Evaluation of effect of drugs on the voluntary motor activity; Cross circulation experiment in dogs; Local anesthesia; Guinea pig intradermal test; Local anesthesia, surface anesthesia (rabbit eyes); Plexus anesthesia in frogs; Evaluation of pyrogens and antipyretic agents.

Books Recommended

Pharm. 707  Pharmacology of Autonomic Nervous System  3(2-1)

Theory
General considerations about physiology and pharmacology of ANS; Acetylcholinesterase; Storage and release of acetylcholine in cholinergic transmission; Adrenergic transmission; Synthesis, storage and release of catecholamines; Cholinergic agonists; Choline esters; Cholinomimetics natural alkaloids and synthetic analogs; Anticholinesterase agents; Atropine, scopolamine & related antimuscarinic drug; Therapeutic uses of antimuscarinic drugs; Norepinephrine, epinephrine & other sympathomimetic amines; Pharmacology of Isoproterenol, dopamine, dibutamine and other non-catecholamines selective β2- Adrenergic stimulants; Terbutaline salbutol, albuterol and therapeutic uses of sympathomimetic drugs; Alpha-adrenergic blocking agents; Phenoxybenzamine & related haloalkylamines and therapeutic uses; β -adrenergic blocking agents; Centrally acting agents that interfere with adrenergic neuron blocking agents; Monoamine oxidase inhibitors; Ganglionic stimulating and blocking agents; Neuromuscular blocking agents; Review of recent advances in cholinergic and adrenergic receptors.

Practical
Exercises to learn the use of dynograph; Study of effect of autonomic drugs on small unanesthetized animals; Dogs and rat’s blood pressure and respiration; Ganglion blocking agents and cat’s nictitating membrane experiment; Frog rectus abdominis muscle and muscle relaxant drugs; Dog’s tibialis anterior muscle and neuro-muscular blocking agents; Effects of autonomic drugs on eyes in rabbits.

Books Recommended

Pharm. 708  Renal and Reproductive Pharmacology  3(2-1)

Theory
Ultrastructure of the Kidney; The formation of urine; Regulation of Acid-Base and water balance; Renal clearance; Active transport system in the nephron; Competition, saturation and inhibition; Renal elimination of drugs; Glomerular filtration, proximal tubular secretion; Distal tubular reabsorption; Review of some hormones affecting the kidney; Aldosteron and rennin-angiotension system; Introduction to diuretics; Kidney Physiology and specific diuretics, glomerulus, proximal convulated tubules; Thiazide diuretics; Control of Potassium Secretion, collecting tubules and duct; Potassium-Sparing diuretics, mobilization of edema fluid, treatment of diuretic- induced hypokalemia; Renal diseases; Agents affecting uterine motility, oxytocin and prostaglandin, ergot alkaloids; Drugs used to inhibit premature labour; β2 adrenergic antagonists and magnesium sulphate; Prostaglandin’s synthetase inhibitors, oxytocin antagonists; Antifertility agents.
Practicals:
Measurements of glomerular filtration rate in laboratory animals; Renal clearance of creatinine and inulin; Studies on the renal clearance of tetracyclines, penicillins, cephalosporins, aminoglycosides, macrolides and quinolones antibiotics; Effects of drugs on the renal function; Demonstrations of diuretics and antidiuretics in laboratory animals.

Books Recommended

Theory
Chemotherapy of microbial diseases; Introduction to the sulfonamides; Antibiotics; The penicillins; Cephalosporins; The tetracyclines; Aminoglycosides; Tetracyclines; Quinolones; Miscellaneous antimicrobial; Antifungal and antiviral agents; Chemotherapeutics used against parasites; Antiprotozoan, anthelmintic insecticides; Use of insecticides in domestic animals; Rodenticides; Chemotherapy of neoplastic diseases; Alkylating agents; Antimetabolites, hormones and other antiproliferative agents; Drugs used for the prophylaxis and treatment of avian, aquatic and wild animals; Cardiovascular drugs; Cardiac glycosides; Antiarrhythmic drugs; Antihypertensive drugs; Vasodilator drugs; Antiatherosclerotic drugs; Water, salts and ions; agents effecting volume and composition of the body fluids cations; calcium, magnesium, barium, lithium, and ammonium; Anions phosphate, iodide, fluoride and other anions; Hormones and their antagonists; Contraceptive agents; Water-soluble and fat soluble vitamins.

Practical
Demonstration of pharmacodynamics of drugs acting on heart; Blood pressure and urinary system; Effect of drugs on the gastric acid secretion; Surgical techniques for the study of action of drugs on the gastro-intestinal tract; Action of drugs on haematopoietic system and blood.

Books Recommended
Pharm. 710 General Principles of Toxicology 3(2-1)

Theory

History and scope; Introduction; Different areas of toxicology; Spectrum of toxic dose; Classification of toxic agents; Characteristics of exposure; Spectrum of undesired effects; Allergies; Idiosyncrasies; Interaction of chemicals; Tolerance; Dose-response Calculations; Margin of safety; Selective toxicity; General mechanisms of toxicity; Interaction with biomolecules; Predictive toxicology; Basic requirement of testing, chemistry, biology and other indices; Lethality, safety standards, biochemical, molecular and physiological mechanisms of toxicology; Pathobiology, chemical insult, cell injury and cell death; Response of major organ systems to chemical insults; Risk assessment; Uncertainties in risk assessment; Qualitative risk assessment; Factors influencing toxicity; Factors related to the toxic agent; Exposure situation; Internal and external environments of subject; Manifestation of Toxicity; Biodisposition of toxic agents; Absorption; Distribution; Metabolism and excretion of toxicants; Toxicokinetics.

Practicals

Experimental animals toxicity tests; Skin irritation tests; Eye irritation tests; Acute, sub acute and chronic toxicity testing; LD 50 determination; Field studies of risk assessment; Allergic response testing; Local lymph node assay to differentiate between allergens and irritants; Determination of residues in milk, meat and eggs.

Books Recommended


Pharm. 711 Systemic Toxicology 3(2-1)

Theory

Poisons causing respiratory insufficiency; Poisons hindering oxygen uptake; Poisons hindering oxygen transport to tissues; Poisons inhibiting oxygen utilization by tissues; Poisons markedly increasing tissue oxygen demand; Poisons having multiple actions on respiratory efficiency; Poisons causing nervous stimulation or depression; Poisons directly damaging the brain and spinal card; Poisons causing colic, poisons causing liver and kidney damage; Toxic response of the immune system; Heavy metals and their antagonists.

Practical
Demonstration of different poisonings e.g. strychnine poisonings in the animals; Organophosphate poisoning in animals; Measurement of different toxicants in the different samples such as blood, milk, meat and eggs; Demonstration of antidotes of organophosphate and strychnine poisonings; Residue determination of antibiotics, pesticides and heavy metals.

**Books Recommended.**

**Pharm. 712 Biochemical Pharmacology 3(2-1)**

**Theory**

Histochemistry of biochemical lesions; Pharmacological aspects of immunohistochemistry; Functions of cellular and sub-cellular structures; Bacterial walls and membranes, mitochondria, drugs and lysosomes; Transfer of ions and molecules across cell membranes; Effect of drugs on structure, biosynthesis and catabolism of nucleic acids, proteins, carbohydrates and lipids; Drugs forming reversible complexes with DNA, inhibition of the synthesis of precursors of nucleic acids (RNA & DNA), mode of action of antiviral agents; Molecular investigation of metabolism and transport of drugs; Biochemical aspects of drug-drug interactions; DNA damage due to excessive usage of xenobiotics; Potential hazards/safe effects at molecular levels produced by drugs.

**Practical**

Isolation and purification procedures; Chromatography; Thin layer and paper chromatography; Centrifugation of sub-cellular components; Introduction to enzyme kinetics; Methods of studying enzymic reactions; The Gilson respirometer; Effect of drugs, pH, temperature, substrate and enzyme concentration on enzyme catalyzed reactions.

**Books Recommended**

Pharm. 713 Pharmacology of Autacoids 3(2-1)

Theory

Histamine and antihistamines; 5-hydroxytryptamine (serotonin) and their antagonists; Polypeptides; Angiotensin and endogenous rennin-angiotensin system; Inhibitors of the rennin-angiotensin system; Role of hypertension; Plasma kinins; Kallidin; bradykinin; kallikrein and other Kinins; Vasodilator peptides prostaglandins; Prostacyclin; Thromboxane A2 and leukotriens; Possible function in physiological and pathological processes and therapeutic uses; Synthesis, storage, release, metabolism and pharmacological actions of substances such as histamine, 5 – hydroxytryptamine, kinins, substance P, prostaglandins, leukotrienes and platelet activation factor; Substances released during anaphylaxis; Antigen-antibody reactions as they affect allergic and inflammatory states; Drugs used in the treatment of allergies; Acute inflammatory conditions and collagen diseases.

Practical

Assay of histamine on the guinea pig ileum; Experiment on histamine-antihistamine antagonism on isolated guinea-pig ileum; Histamine and anaphylaxis; Experiment on 5-hydroxytryptamine-lysergic acid diethylamide antagonism on rat hind quarter preparation; Experiment on the formation of histamine from histadine.

Books Recommended


Pharm. 714 Advanced Reading in Pharmacology & Toxicology 1(1-0)

Theory

Review and critique of the papers published in recent international journals; Proceedings and periodicals; The students will select a relevant paper from a recent journal and present the detail of techniques used; Results obtained and his own critique on the validity and use of the results and conclusions with his own recommendations; Following journals will be selected:

Nature

Science

Cell

Pharmacological Reviews
Pharm. 715  PHARMACOLOGY OF INDEGINOUS MEDICINAL PLANTS  3(1-2)

Theory

What is Phytotherapy; History of Phytotherapy; The science of herbal medicines; The nomenclature of herbal medicine; Efficacy of herbal drugs; Findings vs. feelings; Undesirable effects; Phytotherapy and prevention; Basic and specialized medical training in Phytotherapy; Guidelines for prescribing medicinal plants; Individualized prescription; Methods for preparing herbs for prescription.

Practical

Collection and preservation of medicinal plants from different areas of Pakistan; Extraction from medicinal plants (aqueous and ethanolic extraction); In vivo and In vitro experiments to demonstrate affects of medicinal plants on various body organs of laboratory animals; Demonstrations of plant extracts on isolated heart perfusion experiment, isolated intestine, isolated nerve-muscle preparation etc; In-vitro antibacterial effects demonstrations; Demonstrations of selected plants on antihyperlipidaemic effects; Demonstrations of selected plants on antidiabetic effects; Demonstrations on HPLC and NMR uses; Seminars and group discussions.

Books Recommended
