AMRITA VISHWA VIDYAPEETHAM

Curriculum For Postgraduate Degree in Pharmacology
(MD Pharmacology)
AMRITA VISHWA VIDYAPEETHAM

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Curriculum For Postgraduate Degree in Pharmacology (MD Pharmacology)

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Duration of the Course: 3 years (full time)
Minimum Qualification: MBBS from a Medical Institution recognized by Medical Council of India.

GOAL
To acquire adequate knowledge, necessary skill and expertise in the subject, Pharmacology and Therapeutics, so as to function as an active member of the healthcare team to provide individualized quality care to healthcare seekers and to impart training and to promote research in the field of drug development and utilization.

OBJECTIVES

At the end of the course the candidate should be competent in the following:

1. To utilize the knowledge and skills acquired to promote “Rational therapy and Rational drug use” among health professionals

2. Understand the concept of “Essential Drugs” and be competent to prepare Essential Drug List at the local and national level

3. Act as an expert in the team to provide cost-effective, and safe quality medical care as if tailored to individuals through the following activities:
   - Drug modifications and dosage adjustments in special situations like organ diseases, neonate, paediatric and geriatric age groups, pregnancy, lactation etc
   - Prescription audit and drug utilization studies to critically evaluate the Prescribing habits
   - Cost- benefit analysis
   - Epidemiological studies related to drug utilization
   - Analysis of sales promotional activities
   - Identify non-essential and dubious drug combinations
   - Fully involved in Pharmacovigilance related activities for safe drugs in the market

4. Know the process of drug development and different phases of clinical trial

5. Basic knowledge of research protocol writing

6. Elementary knowledge of biostatistics

7. Plan and carry out research and develop the discipline pharmacology

8. Promote and practise medical ethics in all the activities like treatment, research, clinical trial etc

9. Basic knowledge of international and national and laws, rules and regulations related to drugs and clinical trial

10. Adequate skill to carry out procedures like therapeutic drug monitoring, bioassay, chemical tests etc and to interpret the data elicited

11. Communication skill for effective interpersonal interaction and patient education

MODE OF TRAINING
• Dissertation / thesis on any contemporary topic  
• Problem based self learning from the original cases in the hospital  
• Refreshing basic knowledge in anatomy, biochemistry, physiology, Pharmacology and microbiology  
• Posting in various clinical departments  
• Clinical Pharmacology to be given more importance  
• Sessions on research methodology and biostatistics  
• Practical exercises  
• Drug screening methods  
• Develop communication skill  
• Develop teaching skill  
• Journal Club presentations  
• Seminars  
• Integrated learning- horizontal and vertical with other disciplines  
• Continued medical education programmes, conferences, clinical meetings  
• Take part in any activity related to the subject objective irrespective of the basic department involved  
• Engage in activities related to undergraduate teaching programme  
• Involvement in the departmental academic activities  

SYLLABUS - THEORY (WRITTEN AND ORAL) 

GENERAL GUIDELINES  
• All the topics in a standard textbook  
• The topics listed are only guidelines - Newer drugs may be added and obsolete ones may be deleted  
• Knowledge of essential drugs in the national list  
• Candidate should know common diseases of the community and their therapy  
• Study from examination point of view: classification, kinetics (when dosage adjustment is necessary or pharmacogenetic alteration is expected), dynamics, uses, adverse effects (side effects, toxic effects, interactions, caution, contraindications etc), future trends  
• Study the prototype and compare it with other commonly used Preparations  
• For any drug, knowledge of clinical application is a must  
• No need to study banned drugs  
• Know various National programmes  
• Concentrate on WHO guidelines for treatment of various diseases  
• Advances in the discipline of Pharmacology and therapeutics  

MAJOR HEADINGS OF SPECIFIC TOPICS 

General Pharmacology
History – Development of Pharmacology as a separate discipline
Major discoveries in the field of medicine
Introduction and definitions
Nature and sources of drugs
Dosage forms of the drugs
Routes of drug administration
Pharmacokinetics:
- Absorption, membrane transporters and drug response; distribution; metabolism; elimination
- Clinical pharmacokinetics and issues in therapeutics (Dosage adjustment according to clearance, age etc)
Pharmacodynamics
- The site and mechanism of action
- Receptors and concentration response relationships
- The qualitative aspects of drug action (Adverse drug reactions, interactions etc)
- The quantitative aspects of drug action (Dose – response relationships)
- Factors influencing dosage and response
Special aspects of paediatric pharmacology
Special aspects of geriatric pharmacology
Pharmacogenomics, gene therapy, and emerging molecular therapies
Concept of essential drugs
Rational therapy and rational use of medicine
Pharmacoeconomics
Evaluation of new drugs (Regulated drug development)
Pharmacovigilance

Drugs Affecting the Autonomic Nervous System
- Neurotransmission: The autonomic and somatic motor nervous systems
- Muscarinic receptor agonists and antagonists
- Anticholinesterase agents
- Adrenergic agonists and antagonists

Drugs Acting on Peripheral (Somatic) Nervous System
- Skeletal muscle relaxants
- Local anaesthetics

Drugs Affecting the Brain and Behaviour
- Neurotransmission and the central nervous system
- Therapeutic gases: oxygen, carbon dioxide, nitric oxide and helium
- General anaesthetics
- Hypnotics and sedatives
- Drug therapy of depression and anxiety disorders
- Pharmacotherapy of psychosis and mania
- Pharmacotherapy of the epilepsies
- CNS stimulants
Ethanol and other alcohols
- Opioid analgesics and opioid antagonists
- Drug dependence and drug abuse
- Drug therapy of central nervous system degenerative disorders.

Drugs Affecting Renal and Cardio Vascular System and Related Autacoids
- Regulation of blood pressure by the autonomic nervous system
- Renal tubule transport mechanisms
- Diuretics
- Vasopressin and other agents affecting the renal conservation of water
- Renin-angiotensin system and its inhibitors
- Nitric oxide donors and inhibitors
- Drug therapy of myocardial ischaemia
- Drug therapy of hypertension
- Drug therapy of cardiac arrhythmias
- Drug therapy of heart failure
- Drug therapy of hypercholesterolaemia and dyslipidaemia

Drugs Acting on Blood and Blood Forming Organs
- Haematopoietic agents, growth factors, minerals, vitamins and antioxidants
- Drugs affecting coagulation, fibrinolysis and platelet functions

Autacoids: Drug Therapy of Inflammation
- Histamine, bradykinin, 5-hydroxytryptamine and their antagonists
- Lipid-derived autacoids: eicosanoids and platelet activating factor
- Nonsteroidal antiinflammatory agents, antirheumatic and antigout drugs
- Pharmacotherapy of asthma

Drugs Affecting Gastrointestinal Functions
- Pharmacotherapy of gastric acidity, peptic ulcer and gastroesophageal reflux disease
- Treatment of disorders of bowel motility and water flux; antiemetics; agents used in biliary and pancreatic diseases
- Pharmacotherapy of inflammatory bowel disease

Hormones and Hormone Antagonists (Endocrines and Reproductive System)
- Pituitary hormones and their hypothalamic releasing factors
- Thyroid and antithyroid drugs
- Estrogens and progestins; ovulation inducing agents; hormonal contraceptives
- Drugs acting on the uterus
- Androgens, antiandrogens, drugs for erectile dysfunction
- Adrenocorticotropic hormone; adrenocortical steroids and their synthetic analogues; inhibitors of the synthesis and actions of adrenocortical hormones
- Insulin, oral hypoglycaemic agents, related drugs and the pharmacology of the endocrine pancreas
- Agents affecting mineral ion homeostasis and bone turnover
Chemotherapy of Parasitic Infections
- Chemotherapy of protozoal infections: malaria, amoebiasis, giardiasis, and trichomoniasis
- Chemotherapy of helminthic infections

Chemotherapy of Microbial Diseases
- General considerations of antimicrobial therapy
- Bacterial cell wall inhibitors
- Inhibitors of bacterial ribosomal actions
- Bacterial folate antagonists, fluoroquinolones and other antibacterial agents
- Selection of an antibacterial agent
- Antimicrobial agents for prophylaxis
- Chemotherapy of tuberculosis, Mycobacterium avium Complex disease and leprosy
- Antifungal agents
- Antiviral drugs for non-retroviral infections
- Antiretroviral agents and treatment of HIV infection
- Antiseptics, disinfectants

Chemotherapy of Neoplastic Diseases
- Antineoplastic agents

Immunomodulators
- Immunosuppressants, tolerogens, and immunostimulants
- Vaccines and sera

Dermatology
- Structure and function of skin
- General guidelines for topical therapy
- Topical glucocorticoids and retinoids,
- Sunscreens
- Photochemotherapy
- Antihistamines
- Antimicrobial agents
- Antifungal agents
- Antiviral agents
- Agents used to treat ectoparasites
- Cytotoxic, immunosuppressant and antiinflammatory agents
- Biological agents
- The treatment of pruritus
- Drugs for hyperkeratotic disorders
- Drugs for androgenic alopecia
- Treatment of hyper pigmentation

Ophthalmology
- Ocular pharmacology
- Overview of ocular anatomy, physiology and biochemistry
- Drug Delivery Strategies
Therapeutic and diagnostic applications of drugs in ophthalmology

Toxicology
- Principles of toxicology and treatment of poisoning
  - Dose – response relationship, spectrum of undesired effects
  - Descriptive toxicity tests
  - Prevention and treatment of poisoning
- Heavy metals and heavy metal antagonists

Diagnostic Agents
- Pharmacology of radio-contrast media

PRACTICAL EXERCISES INCLUDING APPLIED PHARMACOLGY

General Considerations
- Log Book of work done is mandatory
- Good laboratory practices
- Good clinical practices
- Laws governing drugs
- Commonly used laboratory animals
- Care of animals, breeding time, food habits etc
- Commonly used laboratory instruments
- Protocol writing and research methodology
- Statistical analysis

Techniques
- Develop skill in biochemical, microbiological and pathological techniques relevant to Pharmacology
- Pharmacokinetic studies
- Therapeutic drug monitoring
- Quality testing of drugs
- Newer – to be added

Animal Experiments
- Interpret the effect of drugs on dog blood pressure, respiration and intestinal movement (computer simulated or prerecorded)
- Experiments on small animals:
  - Routes of administration of drugs: oral, intraperitoneal, and intravenous using rat tail vein or rabbit ear vein
  - Mice - inner canthus of the eye
  - Difference in the onset of action by varying the route of drug administration
  - Effects of analgesics
  - Effects of sedative hypnotics
  - Effects of drugs on rabbit eye
  - Localize the site of action of a drug using a suitable animal model.

- Isolated Tissue Experiments
  - Demonstrate the effects of drugs on frog rectus abdominis muscle
• Record and plot dose - response curves on frog rectus abdominis muscle using agonists and antagonists
• Demonstrate the effects of drugs on frog heart
• Identify the Action of unknown drugs on frog heart
• Demonstrate effect of drugs on ciliary movement of the oesophagus of the frog
• Demonstrate the effects of drugs on rat uterus / colon

❖ Bioassay and Biostandardisation
• Bioassay of acetylcholine, histamine, oxytocin using a suitable tissue by the following methods:
  a. Interpolation c. Matching
  b. Three point assay d. Four point assay

❖ Screening of drugs (minimum three): Examples
  Analgesics Antiepileptics Antipyretics
  Hypoglycaemics Local anaesthetics Muscle relaxants

Identification of Unknown Drug Using Chemical Test / Animal Test
❖ Estimation blood glucose and cholesterol
❖ Alkaloids, glycosides, salicylates, paracetamol, chlorpromazine, diazepam, steroids etc

Communication Skill and Patient Education
❖ Exercises designed to develop specifically communication skill
❖ Exercises designed to develop specifically targeting patient education

Data Analysis
❖ Principles of toxicity studies in animals and calculation of therapeutic index from the data provided
❖ Design and optimization of dosage regimens: Pharmacokinetic data
❖ Dose Calculation to suite various age groups, IV infusion etc

Protocol Writing for Testing a New Drug and Statistical Analysis
❖ Simple examples requiring elementary statistics

Problems Solving Exercises
❖ Problems and discussion based on rational therapy, rational use of medicines, P-drug selection, pharmacoepidemiology, pharmacoeconomics etc
❖ Principles of Prescription order writing and patient compliance

Pharmacovigilance
❖ Problems, notification and reporting
❖ Causality analysis

SCHEME OF EXAMINATIONS
❖ University Examination at the end of 3 years.
❖ Maximum 2 examinations / year at an interval of 4-6 months
Number of Examiners: 4 – 2 Externals and 2 Internals

Maximum number of candidates for Practical / day - 8

4 copies of the dissertation along with a soft copy on a CD to be submitted to the Principal for evaluation 3 months before the final examination.

Approval of dissertation work is a precondition for a pass

Passing Written examination is criterion for appearing for Practical Examination and Viva-voce

Attendance: 80% during each academic year

Written – 4 papers each with 3 hours duration and 100 marks

Practical examination – maximum 3 chances

Practical examination shall have table viva as an integral component

Maximum marks for Practical - 200

Maximum marks for Viva-voce -100

Total marks $400 + 100 + 200 = 700$

Criteria for pass: 50 % separate for Written, Practical and Viva

Distinction :( 1). Pass in first attempt (2) Grand total: 70 % and above

SCHEDULE OF EXAMINATIONS

Written – 4 Papers

Total marks: 400 (100 each -3 hours)

**Paper One**

1) History of medicine with reference to pharmacology

2) General pharmacology including general topics like essential drug concept, rational therapy and Rational use of medicines

3) Paediatric and geriatric pharmacology

4) Drugs and special conditions like pregnancy, lactation, renal and live disease

**Paper Two – Systemic Pharmacology Part-1**

1) General Pharmacology

2) Drugs Affecting the Autonomic Nervous System

3) Drugs Acting on Peripheral (Somatic) Nervous System

4) Drugs Affecting the Brain and Behaviour

5) Drugs Affecting Gastrointestinal Functions

6) Chemotherapy of Parasitic Infections

7) Toxicology

**Paper Three - Systemic Pharmacology Part-2**

1) Drugs Affecting Renal and Cardio Vascular System and Related Autacoids
2) Drugs Acting on Blood and Blood Forming Organs

3) Autacoids: Drug Therapy of Inflammation

4) Hormones and Hormone Antagonists (Endocrines and Reproductive System)

5) Chemotherapy of Microbial Diseases

6) Chemotherapy of Neoplastic Diseases

7) Immunomodulators

8) Dermatology

9) Ophthalmology

10) Diagnostic Agents

Paper IV

1) Pharmacoeconomics

2) Pharmacoepidemiology

3) Advances in Pharmacology

N.B All topics shall include applied aspects

Practical Examination

- Candidate must have passed the written component of the theory examination
- Total marks: 200
- Number of days: 2
- Table viva related to practical topics and relevant theoretical aspects
- Teaching / Communication skill also to be tested
  (To be planned later depending on the final decision on practical)

Viva-voce (Oral)

- Candidate must have passed the written component of the theory examination
• Total marks: 100
• All the theory written examination topics

**TEXT BOOKS RECOMMENDED (Latest Edition)**

1. Goodman and Gilman’s The Pharmacological Basis of Therapeutics
   - Laurence L Brunton

2. Basic And Clinical Pharmacology - Bertram and Katzung
3. Modern Pharmacology with Clinical Applications - Charles R. Craig
4. Pharmacology - Rang And Dale
5. Clinical Pharmacology - P.N.Bennett
7. Principles of Pharmacology - HL Sharma
8. Brody’s Human Pharmacology - Kenneth P Minneman
9. Basic Pharmacology - R.N.Foster
10. Screening Methods - Turner
11. Drug Screening Methods - S K Gupta
13. Experimental Pharmacology - U.K.Seth
14. WHO Publications