

# MD Pharmacology Curriculum

## Goal

A Student upon successfully qualifying in the M.D (pharmacology) examinations should be able to

-

1. Teach pharmacology and therapeutics to students of medical and allied disciplines
2. Teach and train postgraduates and other research fellows.
3. Independently plan and undertake research related to drugs (basic as well as clinical Pharmacology ) and communicate the findings in conferences/journals
4. Set up therapeutic drug monitoring, ADR monitoring, therapeutic audit and drug information Services
5. Plan and conduct toxicity studies and clinical trials.
6. Audit drug utilization and conduct pharmacoepidemiological studies.
7. Act as medical advisor in a pharmaceutical company

## Objectives

At the end of postgraduate training in pharmacology, the student shall be able to

1. Demonstrate sound knowledge of general pharmacological principles and systemic Pharmacology and chemotherapy
2. Plan and conduct lecture, demonstration, practical , symposium and tutorial classes including evaluation for students of medical and allied disciplines.
3. Understand the principles of essential drug concept , P-drug concept, rational use of drugs and legal aspects of prescribing drugs.
4. Carry out screening of drugs for pharmacological and toxicological profile.
5. Carry out drug related literature search, formulate a research project and undertake the same. Apply appropriate statistical methods for summarizing and analyzing data.
6. Present research findings in conferences (oral/poster sessions). Communicate research/educational papers in peer reviewed journals. Critically review and comment on research papers.
7. Measure drug levels in blood and other biological fluids using suitable chemical assay methods /other analytical techniques including spectrophotometry and interpret the same in therapeutic/toxicological context
8. Monitor adverse drug reactions and drug interactions. Carry out therapeutic audit and provide drug information service to doctors/public.
9. Use computer and IT tools for teaching research and presentation/publication of data.
10. Demonstrate knowledge of National Health Programmes and evidence based medicine
11. Understand the importance of pharmacoconomics and pharmacogenomics in patient management.
12. Demonstrate knowledge of drug rules and regulations existing in the country like Drugs and Cosmetic Acts, ICH-GCP guidelines ,Schedule Y , ICMR guidelines etc.

## Detailed Syllabus

The purpose of post graduate curriculum is to standardize pharmacology teaching at Post graduate level throughout Kerala. Accordingly the training in MD Pharmacology should be distinctive from that in M.Pharm (pharmacology) and M.Sc. Pharmacology.

### Duration of the course – 3 years.

#### Post graduate training in MD Pharmacology includes

1. Theoretical knowledge
2. Practical/clinical skills
3. Preparation of thesis
4. Developing competence in basic concepts of research methodology
5. Clinical case discussions
6. Clinical pharmacology training
7. Ethics in clinical research.
8. Developing skills in educational methods as applicable to the teaching and evaluation of MBBS and paramedical students.
9. Computer knowledge

#### Details of Theory

- 1.General pharmacology
- 2.Systemic pharmacology, antibiotics , chemotherapy and therapeutics.
- 3.Clinical pharmacology
- 4.Bioassay methods
- 5.Applied sciences
- 6.Biostatistics and their application in research
- 7.Recent advances in Pharmacology
- 8.Screening methods of drugs
- 9.Structure activity relationship of drugs.
10. Drug poisoning and their management
11. Special problems related to drug use in different age groups, pregnancy and disease conditions
12. Research methodology

#### Teaching/learning Methods

1. Active self learning
2. Lectures
3. Interactive Seminars
4. Group discussions
5. Journal clubs
6. Clinical case discussions
7. Clinical postings in various clinical and non clinical departments to done in first year

- General medicine – 2 weeks
- Paediatrics-1 week
- Cardiology- 1 week
- Dermatology- 1 week
- Psychiatry -1 week
- Neurology- 1week
- Respiratory medicine- 1week
- Medical Gastroenterology- 1week
- Biochemistry- 2 days
- Microbiology – 2 days
- Toxicology lab- 2 days
- Clinical pharmacy- 2 days

**8.** Participate in undergraduate training program

## **Details of practicals**

### **I. Experimental pharmacology exercises (invitro)/interpretation/simulations**

- 1) Bioassay of acetylcholne on rat colon using matching /bracketing assay. Calculations and plotting on log paper
- 2) Bioassay of oxytocin on rat uterus using matching /3point assay
- 3) Bioassay of serotonin on rat fundus using matching / 3 point assay. Calculations and plotting on log paper
- 4) Dose response curve of histamine on isolated guinea pig ileum
- 5) Bioassay of histamine on guinea pig ileum by matching method/ interpolation
- 6) Study of drug action on isolated rabbit heart(Langendorff's technique)

### **II. Experimental pharmacology exercises (invivo)**

1. Study of local anaesthetics on rabbit cornea and by guinea pig intradermal wheal method
2. Study of analgesic activity of drugs using analgesiometer
3. Study of anti inflammatory activity of drugs against carraginin induced rat paw edema
4. Effect of psychopharmacological drugs on conditioned avoidance response (cook's pole climbing)
5. Effect of psychopharmacological agents on elevated plus maze
6. Effects of drugs on spontaneous motor activity of mice – photoactometer
7. To demonstrate muscle relaxant property of diazepam in mouse using rotarod apparatus
8. Study of miotics and mydriatics on rabbits's eye.
9. Interpret graphs available on dog BP experiment
10. Interpret and practice virtual dog BP experiments

### **III. Clinical pharmacology exercises**

1. Writing protocol for clinical trials and other biomedical research(presentation & discussion)
  - Antihypertensives
  - Antianginal

- Analgesic
- Anti inflammatory
- Anticonvulsant
- Antipsychotic
- Antidepressant
- Hypnotic
- Antiparkinsonian drug
- Skeletal muscle relaxants
- Local anaesthetics
- Antihistamine
- Antitussive
- Antiulcerogenic drugs
- Diuretic
- Antiemetic
- Hypolipidemic drugs
- Anti malarial drugs
- Antitubercular drugs
- Antifertility drugs
- Antiasthmatic
- Antiobesity
- Bioavailability studies

2. Monitoring adverse drug reaction and detecting causality of adverse reactions.
3. Drug related problem solving exercises
4. Training at drug information centre, therapeutic drug monitoring and poison information centre
5. Comment on drug advertisement
6. Comment on a journal research article
7. Visit to CRO/pharmaceutical industry/clinical trial site
8. Learning Principles of PCR , HPLC , Immunoassay, spectrophotometer
9. Clinical pharmacokinetic parameter calculations- clearance, Vd, bioavailability ,AUC, half life
10. Ethics in clinical research
11. Pulmonary function test and ECG recording in volunteers
12. Drug utilization studies
13. Knowledge of Helsinki declaration, GCP guidelines, ICMR guidelines, Schedule Y, INSA guidelines

#### **IV. Chemical pharmacology exercises**

1. Identification of Salicylates, Paracetamol, Atropine and steroids by chemical tests.
2. Estimation of drug levels using colorimetry and Spectrophotometry

## **V. Minor procedures**

1. Injection of drugs through marginal ear vein of rabbits
2. Oral administration in mice or rats
3. Intraperitoneal and subcutaneous injections in mice and rats.
4. Techniques of handling animals

## **VI. Experimental methods discussion**

Screening and evaluation of drug activities including animal models for the study of the following actions

- Analgesic
- Anti-inflammatory
- Local anaesthetics
- Drugs for peptic ulcer
- Anti convulsants
- Antianxiety
- Antipsychotics
- Antidepressants
- Hypnotic
- Antihypertensives
- Antianginal
- Antifertility
- Bronchodilator
- Antidiabetic
- Diuretic

## **VII Evaluation**

To be conducted periodically throughout the course

## **VII. Log book write up**

Main purpose of logbook should be to document the work done daily– all experiments and clinical pharmacology exercises , journal clubs, group discussion, seminar presentation, workshops and conference attendance, undergraduate teaching assignments and marks of final model examination

Log book to be signed monthly by HOD

Recommended Books

1. Goodman & Gilman's The pharmacological Basis of Therapeutics. Hardman JG & Limbird LE (Ed), publisher: McGraw-Hill, New York.
2. Basic & Clinical pharmacology. Katzung BG (Ed), publisher: Prentice hall. International Ltd, London.
3. Avery's Drug Treatment. TM Speight & NHG Holford (Eds), Adis international.
4. Principles of drug action. The Basis of Pharmacology. WB Pratt & P Taylor (Eds). Churchill Livingstone, Edinburgh.

5. Pharmacology & Pharmacotherapeutics, Satoskar RS, Bhandarkar SD(Ed) ,Publisher: Popular Prakashan Bombay.
6. Essentials of Medical Pharmacology, Tripathi KD (Ed), Jaypee brothers, Publisher : Medical publishers(P) limited.
7. Clinical pharmacology, Laurence DR, Bennet PN, Brown MJ(Ed). Publisher :Churchill Livingston.
8. Critical appraisal of epidemiological studies and clinical trials- Mark Elwood. Oxford Press.
9. Pharmacology .Rang HP, Dale M.Ritter JM 4<sup>th</sup> ed.Edinburgh, Churchill Livingstone. 1999
10. Evaluation of Drug activities: Pharmacometrics. DR Laurence & A1. Bacharach (Eds),Academic press, London.
11. Selected Topics in Experimental Pharmacology, UK. Sheth,NK Dadkar & U G Kamat. Kothari Book Depot, Mumbai.
12. Fundamentals of Experimental Pharmacology. MN Ghosh (Ed), Scientific book Agency, Calcutta.
13. Introductory Medical Statistics. Mould RF (Ed), Adam Hilger, Bristol and Philadelphia, 1989.

### **Post Graduate examination**

Post Graduate examination shall be in three parts

**I) Thesis:** to be submitted by each candidate at least 6 months before the date of commencement of theory examination.

**II) Theory :** there shall be four theory papers

Paper I- General pharmacological principles and applied sciences.

Paper II- Systemic pharmacology, Chemotherapy & therapeutics

Paper III- Experimental pharmacology, Bioassay & statistics

Paper IV- Clinical pharmacology & recent advances.

### **Contents of each paper**

#### **Paper I- General pharmacological principles and applied science**

Drug receptors and pharmacodynamics, dosage forms, drug delivery systems, Pharmacokinetic principles & parameters; Factors modifying drug action, pharmacogenetic, pharmacogenomics, Orphan drugs & diseases; chronopharmacology, adverse Drug reactions; Drug interactions, drug dependence; synergism; Antagonism; fixed dose Combinations; Toxicology;Dose response relationships; drug development and regulation of drugs, therapeutic index, Etiopathogenesis of diseases relevant to therapeutic use of drugs; gene therapy & evidence based medicine; special aspects of perinatal, paediatric and geriatric pharmacology; rational prescribing; Translational medicine

#### **Paper II- Systemic Pharmacology, chemotherapy and therapeutics.**

Pharmacology of drugs acting on autonomic, peripheral & CNS, cardiovascular, endocrine respiratory, renal, gastrointestinal and haemopoietic systems and treatment of diseases affecting

these systems; Pharmacology of antimicrobial, antihelminthic, antiprotozoal, antifungal, antiviral and antimycobacterial drugs ; treatment of other infective diseases; cancer chemotherapy; Immunopharmacology, dermatological pharmacology, ocular pharmacology

### **Paper III- Experimental pharmacology, Bioassay and statistics**

Common laboratory animals; anaesthetics used in labs; Physiological salt solutions; Care & handling of lab animals; bioassay of antagonist; breeding types and methods; methods of euthanasia; CPCSEA, IAEC composition & function; Restraining of animals & blood collection methods; euthanasia method used in experimental study; Bioassay Methods & bioassay of histamine, acetylcholine, oxytocin and catecholamine; Dose Response curve, cumulative dose response curve, animal models disease induced & transgenic animals; rabbit, mice, rat & of guinea pig as experimental animals; recombinant DNA technology; immunoassays; drug screening methods involved in the evaluation of antiulcer, antidepressant, antianginal, antihypertensive, antidiabetic, antifertility, antipsychotic, hypnotic, anti-inflammatory, antipyretic, antiasthmatics, herbal drugs; Good Laboratory Practice; ethics In animal research; toxicity testing in animals; levers used;

### **Paper IV. - Clinical Pharmacology and recent advances.**

Development of new drugs ,protocol designing, phases of clinical trial, study design, and ethics of clinical trials; Clinical pharmacokinetics and pharmacodynamic studies, Post marketing surveillance. Therapeutic drug monitoring, pharmacogenomics, pharmacovigilance, Drug Information services, drug utilization studies, & therapeutic audit, essential drug Concept and rational drug use; Good clinical practice; P- drug concept, HPLC, PCR, Chromatography; Recent advances in understanding of mechanism of drug action & treatment of diseases; New drugs & new uses of old drugs.

### **III)Practicals**

Should be spread over 2 days.The practical examination should consist of the following.

1. One experimental pharmacology exercise on intact animal.
2. One experimental pharmacology exercise on isolated organ.
3. One minor procedure exercise
4. One chemical pharmacology exercise.
5. One clinical pharmacology exercise from the list given below
  - a) Drug related problem solving exercise
  - b) Writing a protocol for a clinical trial.
  - c) Comment on a paper reporting a clinical trial.
  - d) Comment on a drug advertisement
  - e) Statistical evaluation of a given data

All practical exercises are to be evaluated jointly by all the examiners.An oral question- answer session should be conducted at the end of each practical exercise.

6. Pedagogy- 10 minutes

7. General viva voce and viva on dissertation and research methodology and Pharmacotherapeutics

**Model Question Paper**  
**Kerala University of Health Sciences**  
**MD PHARMACOLOGY DEGREE EXAMINATION**

Max:100 marks

Time: 3 Hours

**PAPER I**

**GENERAL PHARMACOLOGICAL PRINCIPLES AND APPLIED SCIENCES**

I. Describe the bio transformation of drugs. Discuss the factors affecting it. Discuss the clinical relevance.

(20 marks)

II. Write briefly on

(10 x 8 = 80)

1. Fixed dose combination of drugs
2. Structure activity relationship of corticosteroids
3. Second messengers
4. Drug therapy during pregnancy
5. Plasma protein binding
6. G protein coupled receptors
7. Plasma half life
8. Orders of kinetics and their clinical importance

**PAPER II**

**SYSTEMIC PHARMACOLOGY, CHEMOTHERAPY AND THERAPEUTICS**

I. a) Discuss the current status of pharmacotherapy of tuberculosis

b) Discuss short course chemotherapy

(20 Marks)

II. Write short notes on

(10 x 8 = 80)

1. Treatment of migraine
2. Hormone replacement therapy
3. Fluroquinolones
4. Treatment of osteoporosis
5. Drug therapy of glaucoma - Newer concepts
6. Insulin analogues
7. Monoclonal antibodies
8. Amiodarone



### **PAPER III**

#### **EXPERIMENTAL PHARMACOLOGY, BIOASSAY AND STATISTICS**

I. Describe methods used to evaluate anti-inflammatory drugs

(20 Mark)

II. Write short notes on

(10 x 8 = 80)

1. Students 't' test
2. Design of acute toxicity tests
3. Log dose response curve
4. Rat as an experimental animal in Pharmacology
5. Detection and estimation of acetylcholine
6. Volume of distribution of drugs
7. HPLC
8. Physiological salt solutions

### **PAPER IV**

#### **CLINICAL PHARMACOLOGY AND RECENT ADVANCES**

I. Design a phase II clinical trial for the study of an antihypertensive activity of a new drug molecule

(20 Mark)

II. Write briefly on

(10 x 8 = 80)

1. Pharmacovigilance
2. Cytokines as potential therapeutic targets
3. Drugs for treating obesity
4. Atypical antidepressants
5. Treatment of Alzheimer's disease
6. Treatment of venous thrombosis
7. Therapeutic drug monitoring
8. Melatonin



