

## **MD PHARMACOLOGY**

### **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

- 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
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8. Participate in undergraduate training program

### **Details of practicals**

#### **I. Experimental pharmacology exercises (invitro)**

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 hotplate method and acetic acid induced writhing
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. Pre clinical toxicity testing
10. Interpret graphs available on dog BP experiment
11. Interpret and practice virtual dog BP experiments using EXPHARM

### **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
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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 paper reporting clinical trial
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. Collection of blood from orbital sinus of rats and mice with capillary tube
2. Collection of blood by cardiac puncture in rats
3. Injection of drugs through marginal ear vein of rabbits
4. Oral administration in mice or rats
5. Intraperitoneal and subcutaneous injections in mice and rats.

#### **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

## **VIII. Log book write up**

Main purpose of logbook should be to document the work done – 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

### **Details of each paper**

#### **Paper I**

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; structure activity relationships of steroids, antihistamines, catecholamines opioids & antipsychotics; gene therapy & evidence based medicine; special aspects of perinatal, paediatric and geriatric pharmacology; rational prescribing; Translational medicine

#### **Paper II**

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, antihelmintic, antiprotozoal, antifungal, antiviral and antimycobacterial drugs; treatment of other infective diseases; cancer chemotherapy; Immunopharmacology, dermatological pharmacology, ocular pharmacology

#### **Paper III**

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**

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.

#### **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 Livingstone.
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.

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