Department of Pharmacology & Therapeutics, King George's Medical University UP Lucknow

PG Curriculum

1 Learning Outcomes

At the end of the MD training programme in Pharmacology, the student should acquire competencies in the following areas:

1. Acquisition of knowledge

The student should be able to explain clearly concepts and principles of Pharmacology and therapeutics. The student should also be able to explain the drug development processes. S/he should be able to explain Drugs and Cosmetics Act, in addition to clinical trial procedures.

2. Teaching and training

The student should be able to effectively teach undergraduate students in medicine (MBBS) and allied health science courses (Dentistry and Nursing) so they become competent healthcare professionals and able to contribute to training of postgraduate trainees.

3. Research

The student should be able to carry out a research project (both basic and clinical) from planning to publication and be able to pursue academic interests and continue life-long learning to become more experienced in all the above areas and to eventually be able to guide postgraduates in their thesis work.

2 Syllabus

The **course contents** should cover the following broad topics:

1. Basic and molecular pharmacology
2. Drug receptors and Pharmacodynamics
3. Pharmacokinetics (Absorption, Distribution, Metabolism and Excretion)
4. Biotransformation
5. Pharmacogenomics and Pharmacogenetics
6. Autonomic Pharmacology
7. Drugs acting on Smooth muscles
8. Clinical pharmacology
9. Drug development and Regulations
10. Clinical Pharmacokinetics
11. Drugs acting on Synaptic and Neuroeffector Junctional sites
12. Drugs acting on Central Nervous System (Sedative, Hypnotics, Antiepileptics, General Anesthetics, Local Anesthetics, Skeletal Muscle Relaxants,

Antipsychotic, Antidepressants, Drugs used in Parkinson's disease and other

neurodegenerative disorders, opioid agonists and antagonists, Drugs of abuse)
13. Drugs modifying renal function
14. Drugs acting on cardiovascular system and haemostatic mechanisms (Antihypertensives, Antianginal, Antiarrhythmics, Drugs used in heart failure, Drugs used in Dyslipidemias, Fibrionolytics, Anticoagulants, Antiplatelets
15. Reproductive Pharmacology
16. Agents effecting calcification and bone turnover
17. Autacoids and related pharmacological agents (NSAIDs) and drugs used in Rheumatoid arthritis and Gout
18. Gastrointestinal drugs
19. Pharmacology of drugs affecting the respiratory system (drugs used in Bronchial Asthma and COPD)
20. Antimicrobial, antiparasitics, disinfectants, antiseptics
21. Chemotherapy of neoplastic disease
22. Antiviral drugs
23. Drugs used in Autoimmune disorder and Graft versus Host Disease)
24. Dermatological pharmacology
25. Ocular pharmacology
26. Use of drugs in pregnancy
27. Perinatal and Pediatric Pharmacology
28. Geriatric Pharmacology
29. Immunomodulators - immunosuppressants and immunostimulants
30. Pharmacology of drugs used in endocrine disorders (drugs used in diabetes mellitus, hypothalamic and pituitary hormones, thyroid and antithyroid drugs, adrenocorticid hormones and their antagonists, gonadal hormones and their inhibitors)
31. Drug delivery systems
32. Heavy metal poisoning
33. Non-metallic toxicants - air pollutants, pesticides etc.
34. Research methodology and biostatistics
35. Literature search.
36. Pharmacogenomics, Pharmacovigilance (ADR reporting), pharmacoeconomics (cost-effectiveness study) and pharmacoepidemiology
37. Over the counter drugs
38. Dietary supplements and herbal medicines
39. Pharmacometrics - methods of drug evaluation.
40. General screening and evaluation of:

☐**A**nalgesics, antipyretics, anticonvulsants, anti-inflammatory drugs, antidepressants, antianxiety and antipsychotics, sedatives, muscle

relaxants, antihypertensives, hypocholesterolaemic agents, antiarrhythmics, diuretics, adrenergic blocking drugs

☐Drugs used in peptic ulcer diseases/Prokinetic agents/ antiemetics

☐Antitussives, /anti-asthma agents

☐Local Anaesthetics

☐Oxytocics, antifertility agents

☐Antidiabetics

Behavioral pharmacology models and evaluation of drugs affecting learning and memory

41. Bioassays

☐Bioassay methods

☐Animal experiments: Ethical considerations, ethical approval, applicable regulatory Guidelines (CPCSEA), humane animal research (principles of 3Rs) and alternatives to animal experimentation. General and statistical considerations

☐Anesthetics used in laboratory animals

☐Principles of EC50, ED50, pD2 and pA_2 values of drugs

☐Describe methods of bioassay for estimation of :

Acetylcholine, skeletal neuromuscular junction blockers, adrenaline, noradrenaline, histamine, 5 HT, hormones, insulin, vasopressin/oxytocin, estrogen, progestins, ACTH

☐Competitive antagonism - pA_2 values

☐Immunoassays: Concept, types of bioassays and their application/s

☐Animal experiments: Ethical consideration, ethical approval

☐Regulatory Guidelines (CPCSEA) and alternatives to animal experimentation

42. **Biochemical Pharmacology**

☐Basic principles and applications **o**f simple analytical methods

☐Principles of quantitative estimation of drugs, endogenous compounds and poisons using Colorimetry, Spectrophotometry, flame photometry, High Performance Liquid Chromatography (HPLC) and enzyme-linked immunosorbent assay (ELISA).

3- TEACHING LEARNING METHODS

Postgraduate teaching programme

Teaching methodology

Learning in a PG program is primarily self-directed and in Pharmacology consists of laboratory and academic work. The formal sessions are merely meant to supplement this 8

core effort. Acquisition of practical competencies thus becomes the cornerstone of postgraduate medical education in Pharmacology.

Formal teaching sessions

• In addition to laboratory work, at least 6-hr of formal teaching per week is necessary. The departments may select a mix of the following sessions:

Journal club Once a week

Seminar Once a week

Practical Once a week

Group Discussions Once a week

Case discussions Once a month
Interdepartmental case or seminar Once a month
Note: These sessions may be organized as an institutional activity for all postgraduates.
• Attend accredited scientific meetings (CME, symposia, and conferences).
• A postgraduate student of a postgraduate degree course in broad specialities/super specialities would be required to present one poster presentation, to read one paper at a national/state conference and to present one research paper which should be published/accepted for publication/sent for publication during the period of his postgraduate studies so as to make him eligible to appear at the postgraduate degree examination.
• Additional sessions on basic sciences, biostatistics, research methodology, teaching methodology, hospital waste management, health economics, medical ethics and legal issues related to experimentation are suggested.
• There should be a training program on Research methodology for existing faculty to build capacity to guide research and for keeping abreast with rapidly evolving methods and techniques in related disciplines.
• The postgraduate students shall be required to participate in the teaching and training programme of undergraduate students and interns.
• **Log book:** During the training period, the post graduate student should maintain a Log Book giving details of experimentation done and skills acquired. The log book shall be used to aid the internal evaluation of the student. The Log books shall be checked and assessed periodically by the faculty members imparting the training.
• Department should encourage e-learning activities.
The postgraduate student in M.D (Pharmacology) shall undergo a 3 - year (6 terms of 6 months each) training that will comprise of the following:
I Theory: (lectures, seminars, group discussion, journal club) (at least 6 hours a week, daily 2 hours for 3 days)
II **Rotation:**
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Practical training in the following suggested areas: (8 hours a week, daily 4 hours for 2 days)
• **Experimental Pharmacology:**
In vitro (including bioassays), *in vivo* (including common methods of drug evaluation) experiments, computer simulations and toxicity tests
• **Chemical Pharmacology:**
Identification of drug/toxin by using chemical, biological and analytical tests. Quantitative estimation - Use of colorimeter, spectrophotometer and/or other advanced analytical equipments
• **Clinical Pharmacology:**
I Evaluation of drugs in healthy volunteers as well as patients
II Critical evaluation of drug literature, pharmacoeconomics, pharmacovigilance and pharmacoepidemiology.
III Thesis on a suitable problem
IV Training in undergraduate teaching
V Computer training
During the training programme, patient safety is of paramount importance; therefore, skills are to be learnt initially on the models, later to be performed under supervision followed by performing independently; for this purpose, provision of

skills laboratories in medical colleges is mandatory.

4- **Interdisciplinary training**: Guest lecture from the faculty of other department of KGMU as well as from other University.

5. **ASSESSMENT methods**

FORMATIVE ASSESSMENT ie., assessment during the training
Formative assessment should be continual and should assess medical knowledge, patient care, procedural & academic skills, interpersonal skills, professionalism, self directed learning and ability to practice in the system.
General Principles
Internal Assessment should be frequent, cover all domains of learning and used to provide feedback to improve learning; it should also cover professionalism and communication skills. The Internal Assessment should be conducted in theory and practical/clinical examination.
Quarterly assessment during the MD training should be based on:
1. Journal based / recent advances learning
2. Patient based /Laboratory or Skill based learning
3. Self directed learning and teaching
4. Departmental and interdepartmental learning activity
5. External and Outreach Activities / CMEs
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The student to be assessed periodically as per categories listed in postgraduate student appraisal form (Annexure I)
SUMMATIVE ASSESSMENT, ie., assessment at the end of training
The summative examination would be carried out as per the Rules given in POSTGRADUATE MEDICAL EDUCATION REGULATIONS, 2000.
The post graduate examination shall be in three parts**:**
1. Thesis
Every post graduate student shall carry out work on an assigned research project under the guidance of a recognised Post Graduate Teacher, the result of which shall be written up and submitted in the form of a Thesis. Work for writing the Thesis is aimed at contributing to the development of a spirit of enquiry, besides exposing the post graduate student to the techniques of research, critical analysis, acquaintance with the latest advances in medical science and the manner of identifying and consulting available literature.
Thesis shall be submitted at least six months before the Theory and Clinical / Practical examination. The thesis shall be examined by a minimum of three examiners; one internal and two external examiners, who shall not be the examiners for Theory and Clinical examination. A post graduate student shall be allowed to appear for the Theory and Practical/Clinical examination only after the acceptance of the Thesis by the examiners.
2. Theory examination:
The examinations shall be organized on the basis of ‘Grading’or ‘Marking system’ to evaluate and to certify post graduate student's level of knowledge, skill and competence at the end of the training. Obtaining a minimum of 50% marks in ‘Theory’ as well as ‘Practical’ separately shall be mandatory for passing examination

as a whole. The examination for M.D./ MS shall be held at the end of 3rd academic year. An academic term shall mean six month's training period.

There shall be four theory papers:

Paper I: General Pharmacology

Paper II: Clinical Pharmacology

Paper III: Systemic Pharmacology

Paper IV: Recent Advances in Pharmacology

3. Practical/clinical and Oral/viva voce examination

Practical:

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a) Long Experiment:

Demonstrating effects of drugs/interpretation of results in anesthetized animal

Table exercise - Examples are given below:

- Calculating pharmacokinetic parameters
- Statistical exercise
- Critical appraisal of a published paper (abstract writing of a published paper)
- Evaluation of drug literature.
- Protocol designing
- ADR reporting and causality assessment
- Assessment of preclinical toxicity data
- Analysis of rational and irrational formulations

b) Short experiment

a. Isolated tissue experiment (Bioassay of drugs) (as per Govt regulations)

Or

interpretation of results of a previous tracing

b. *In vivo* experiment

c) Spotting exercises: Various drug delivery systems, inhalers, insulin syringe, drip chamber, various tablets, etc.

Oral/Viva voce Examination

Microteaching (teaching exercise)

Discussion on dissertation

Principles of general and systemic pharmacology

Recent advances in pharmacology & drug therapy