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ONE Touch PHARMACOLOGY

For NEET/NEXT/FMGE/INI-CET

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Ranjan Kumar Patel

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Ranjan Kumar Patel
MD (Pharmacology)
Ex Faculty UCMS and GTB Hospital, Delhi

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4819/XI Prahlad Street, 24 Ansari Road, Daryaganj, New Delhi 110 002, India.

Ph: +91-11-23289259, 23266861, 23266867 Website: www.cbspd.com

Fax: 011-23243014

e-mail: delhi@cbspd.com; cbspubs@airtelmail.in.

Corporate Office: 204 FIE, Industrial Area, Patparganj, Delhi 110 092

Ph: +91-11-4934 4934 Fax: 4934 4935

e-mail: feedback@cbspd.com; bhupesharora@cbspd.com

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- **Mumbai:** PWD Shed, Gala No. 25/26, Ramchandra Bhatt Marg Next to J.J. Hospital Gate No. 2, Opp. Union Bank of India, Noor Baug, Mumbai-400009, Maharashtra
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Representatives

- **Hyderabad** +91-9885175004
- **Pune** +91-9623451994
- **Patna** +91-9334159340
- **Vijayawada** +91-9000660880

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"Hard work can compensate for intelligence, but intelligence can never ever compensate for hard work."

Dr Ranjan Kumar Patel

Preface

Dear students,

To begin with, I would like to thank all the students, whom I have taught for more than 11 years. I would like to thank them for the faith they had in me. Their faith in multiple ways has propelled me to do innovative things in pharmacology. Their constant doubts and suggestions have immensely helped me to be, whoever I am today.

Coming to the idea of this revision book; it stems from constant demand from the students for a concise source to revise or complete pharmacology in lightening speed. I pondered upon the idea for last one year and here I bring to you the entire pharmacology theory in a concise manner, which I hope is going to help you all immensely in your quest to perfection.

What does this book contain?

- Theory (Just 42 pages) – To begin with, the entire theory that I teach in a 5-day class is squeezed into just 42 pages. This has been possible as I have followed a flowchart pattern and used space in a page judiciously.
- Images – Whatever images are important, I have added in 3 pages.
- Drugs of Choice – A separate table of drugs of choice is given alphabetically in just 6 pages. To master these, revise 5 DOC every day before going to bed.
- Antidotes of Choice – A separate table for antidotes of choice is given in one page.
- New Drugs – A concise collection of important new drugs approved in last 3 years is given as a table in just 2 pages.
- Previous Years Questions – PYQs of last 3 years (NEETPG/FMGE/INICET) have been given at last for quick revision before the exam.

How to use this book?

- The students who have completed pharmacology from any source—You can use this as a source for quick revision before the exam.
- The students who have not started studying pharmacology so for and don't have time to cover it—This book will be immensely helpful for these students. This book covers almost 90% content of my class and hence if you can at least remember this, the job in pharmacology is done.
- INICET—Everything is important for this exam including new drugs.
- NEETPG/FMGE/Undergraduates—You can skip new drugs.
- Color coding—Everything that I have marked in red color has been asked in exams or will be asked. So, this color coding will help you to briefly revise the entire content (red ones) few days before the exam.
- Notes page—After every chapter I have given a page for notes. If you get anything extra from class, Q bank or Grand tests; and you feel it's important, you can add in this page.

I have tried my level best to make this book concise, productive and error free. Still if you find any mistake, please notify the same to me at email – ranjankumarpatel@yahoo.com. If you want to connect to me directly, then you can do it directly on Instagram on my handle – @docpharmaniac.

Always remember one of my quotes, "Hard work can compensate for intelligence, but intelligence can never ever compensate for hard work." So, if you have any self doubt regarding your abilities because of your not so good education at your medical school, please clear it out immediately. Irrespective of the place you have graduated from, you can always get a top rank, provided you have strong belief in your abilities.

My best wishes to all of you. Lots of love and blessings!

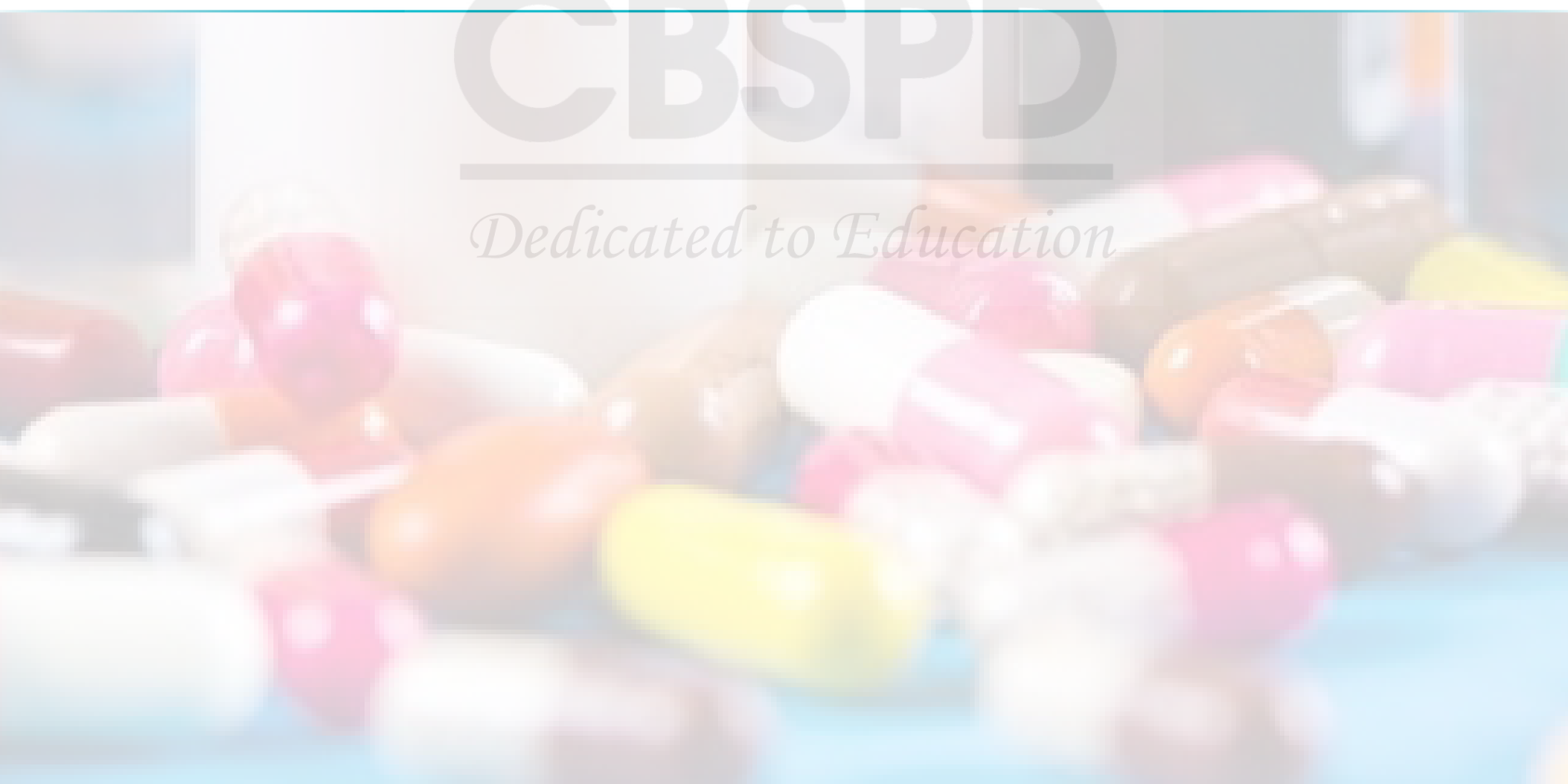
Ranjan Kumar Patel

Abbreviations

ACEI – ACE Inhibitors
ADHD – Attention Deficit Hyperactivity Disorder
ADR – Adverse Drug Reaction
AMP – Adenosine Monophosphate
ARB – Angiotensin Receptor Blockers
AUC – Area Under the Curve
BP – Blood Pressure
BPH – Benign Prostate Hyperplasia
Ca – Calcium
CCB – Calcium Channel Blockers
Cat – Category
CD – Collecting Duct
CDSCO – Center for Drug Standard Control Organization
CHF – Congestive Heart Failure
CKD – Chronic Kidney Disease
Cl – Clearance
C/I – Contraindication
CMV – Cytomegalo Virus
CNS – Central Nervous System
COPD – Chronic Obstructive Pulmonary Disease
CTS – Carpal Tunnel Syndrome
5% D – 5% Dextrose
DCT – Distal Convoluted Tubule
DOC – Drug of Choice
DRI – Direct Renin Inhibitors
ED – Erectile Dysfunction
E. Faecium – Enterococcus Faecium
E. Faecalis – Enterococcus Faecalis
F – Fraction (Bioavailability)
5-FU – 5 Fluoro Uracil
FDA – Food and Drug Administration
FDC – Fixed Dose Combination
GH – Growth Hormone
GnRH – Gonadotropin Releasing Hormone
GMP – Guanosine Monophosphate
GPCR – G Protein Coupled Receptor
GTCS – Generalized Tonic Clonic Seizures
HDL – High Density Lipoprotein
HSV – Herpes Simplex Virus
HTN – Hypertension
IAMA – Intermediate Acting Muscarinic Antagonist
ICP – Intracranial Pressure
ICS – Inhalational Corticosteroid
IGF-1 – Insulin Like Growth Factor -1
IPC – Indian Pharmacopoeia Commission
IV – Intravenous
JME – Juvenile Myoclonic Epilepsy
K – Potassium
Kel – Elimination constant
LABA – Long Acting Beta-2 Agonist
LAMA – Long Acting Muscarinic Antagonist
LDL – Low Density Lipoprotein
LGS – Lennox Gastaut Syndrome
Max – Maximum
MC – Most Common
MI – Myocardial Infarction
MOA – Mechanism of Action
MRSA – Methicillin Resistant Staphylococcus Aureus
MS – Myoclonic Seizures
Na – Sodium
NaSSA – Noradrenergic Specific Serotonergic Antidepressant
NDM-1 – New Delhi Metalo -1
NO – Nitric Oxide
OCD – Obsessive Compulsive Disorder
PC – Plasma Concentration
PCI – Per Cutaneous Intervention
PCOS – Polycystic Ovarian Syndrome
PCT – Proximal Convoluted Tubule
PD – Pharmacodynamics
PDE – Phosphodiesterase
PK – Pharmacokinetics
PN – Peripheral Neuropathy
Pulm – Pulmonary
PS – Partial Seizure
HR – Heart Rate
PSVT – Paroxysmal Supra Ventricular Tachycardia
RAAS – Renin Angiotensin Aldosterone System
RSV – Respiratory Syncytial Virus
SABA – Short Acting Beta-2 Agonist
SAMA – Short Acting Muscarinic Antagonist
S/C – Subcutaneous
S/E – Side-effects
SVC – Superior Vena Cava
S/L – Sublingual
SVT – Supra Ventricular Tachycardia
TAL – Thick Ascending Limb
TB – Tuberculosis
$T_{1/2}$ – Half life
TIA – Transient Ischemic Attack
TKI – Tyrosine Kinase Inhibitors
TOC – Treatment of Choice
TSS – Toxic Shock Syndrome
UTI – Urinary Tract Infection
VKOR – Vitamin K Oxido Reductase
VLABA – Very Long Acting Beta-2 Agonist
VLDL – Very Low Density Lipoprotein
VRSA – Vancomycin Resistant Staphylococcus Aureus
VT – Ventricular Tachycardia
V. Fib – Ventricular Fibrillation
VRE – Vancomycin Resistant Enterococcus
VZV – Varicella Zoster Virus
WPW – Wolf Parkinson's White

Contents

Anticancer Drugs



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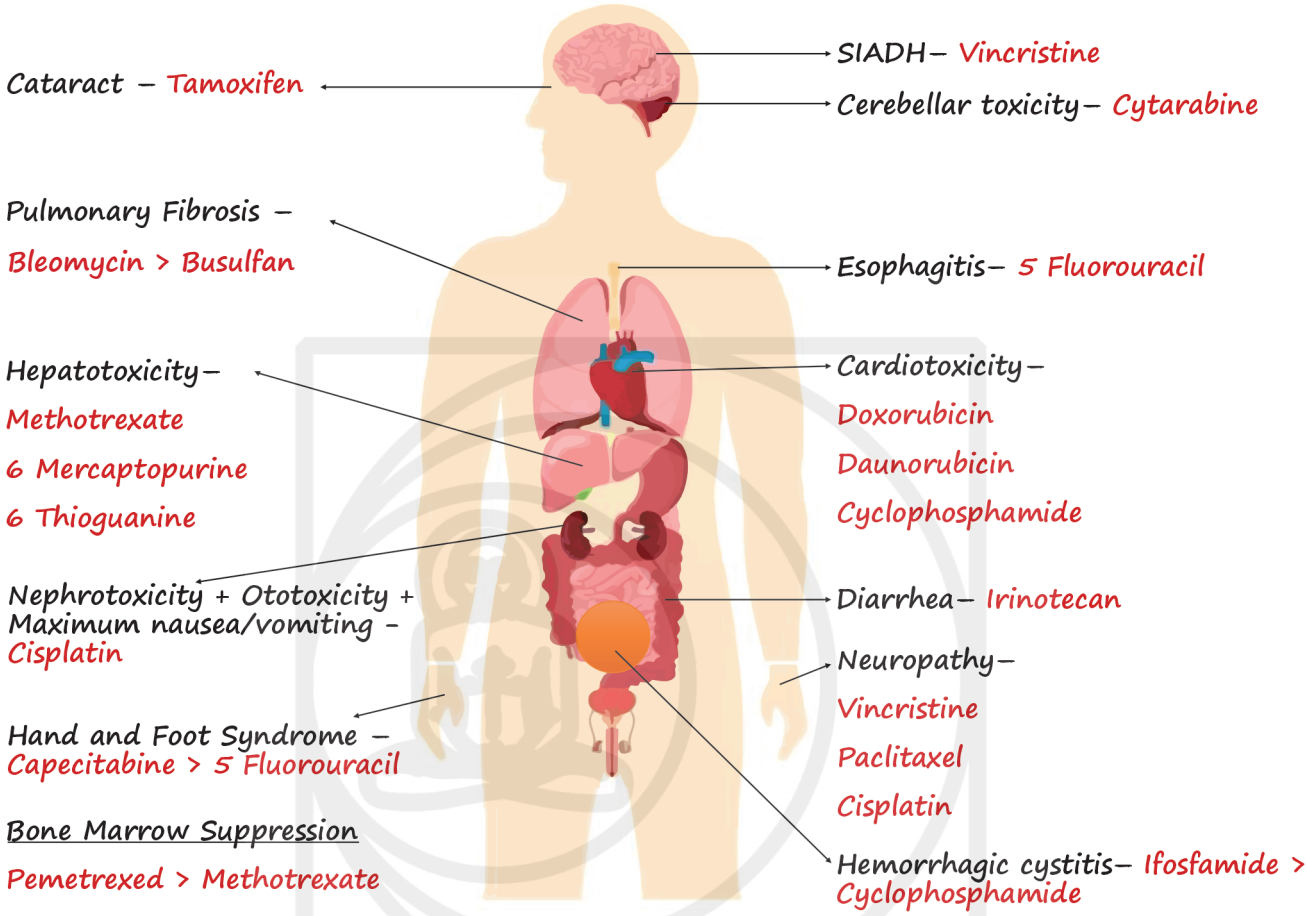

PREVENTION OF ANTICANCER DRUG-INDUCED TOXICITY

Toxicity	Antidote
Hand and foot syndrome	Pyridoxine
Methotrexate associated mucositis and bone marrow suppression	Leucovorin (Folinic acid) or Folic acid
Pemetrexed associated mucositis and bone marrow suppression	Leucovorin (Folinic acid) or Folic acid + Vitamin B_{12}
Anthracyclines induced cardiotoxicity and vesication	Dexrazoxane
Cyclophosphamide and ifosfamide induced hemorrhagic cystitis	Mesna
Hyperuricemia due to tumor lysis syndrome	Solid Tumors – Allopurinol Leukemia – Rasburicase
Mucositis associated with chemotherapy	Palifermin (recombinant keratinocyte growth factor)
Neutropenia	Filgrastim
Thrombocytopenia	Oprelevkin
Anemia	Epoetin alfa Darbopoetin alfa
Irinotecan induced delayed diarrhea	High dose loperamide
Mechlorethamine associated vesication	Thiosulphate

ANTICANCER DRUGS

Non-Cell Cycle Specific Drugs

1. Alkylating Agents

A. Nitrogen Mustards
- Cyclophosphamide – Activated in to 4-hydroxycyclophosphamide
- Ifosfamide
- Mechlorethamine
- Melphalan
- Chlorambucil

B. Nitrosoureas
- Carmustine, Lomustine, Somustine
- Streptozocin

C. AA acting by methylation
- Procarbazine – S/E – Disulfiram like reaction
- Dacarbazine
- Temozolomide
- Miscellaneous
- Busulfan
- Thiotepa

2. Platinum Compounds

A. Cisplatin

B. Carboplatin

C. Oxaliplatin

3. Antitumor Antibiotics

A. Doxorubicin

B. Daunorubicin

C. Idarubicin

D. Epirubicin

E. Mitoxantrone

F. Bleomycin

Cell Cycle Specific Drugs

S-Phase Inhibitors

1. Antimetabolites

A. DHFR Inhibitors (Anti-folate)
- Methotrexate
- PemetrexedPralatrexate
- Raltitrexed

B. Purine Analogs
- 6 Mercaptopurine
- 6 Thioguanine
- Fludarabine
- Cladribine
- Pentostatin

C. Pyrimidine Analogs
- 5 Fluorouracil
- Capecitabine
- Gemcitabine
- Cytarabine (Ara-c)

2. Topoisomerase Inhibitors

A. Topoisomerase-1 Inhibitors
- Irinotecan
- Topotecan

B. Topoisomerase-2 Inhibitors
- Etoposide
- Teniposide

3. Hydroxyurea – DOC – Sickle Cell Disease

4. Histone Deacetylase Inhibitors
- Romidepsin
- Belinostat
- Panobinostat

M-Phase Inhibitors

1. Vinka Alkaloids – Inhibit microtubule polymerization
- Vincristine, Vinblastine, Vinorelbine

2. Taxanes – Promote microtubule polymerization
- Paclitaxel, Docetaxel

3. Ixabepilone – Stabilizes microtubules

Miscellaneous Drugs

1. Retinoic Acid – DOC – Promyelocytic leukemia

2. Asparaginase
- Use – Leukemia
- S/E – Hyperglycemia, Hyperlipidemia, Hypersensitivity, Hypercoagulation, Hemorrhage

3. Proteasome Inhibitors
- Bortezomib, Carfilzomib – Used in multiple myeloma

4. FLT-3 Kinase Inhibitors
- Midostaurin, Gilteritinib – Used in AML

5. MAPK Inhibitors – Used in malignant melanoma

A. BRAF Inhibitors – Vemurafenib, Dabrafenib

B. MEK 1/2 Inhibitors – Trametinib, Cobimetinib

6. PI-3 Kinase Inhibitors – Idelalisib, Duvelisib - Used in CLL, NHL

7. CDK 4/6 Inhibitors – Palbociclib, Abemaciclib, Rivociclib – Used in ER positive breast cancer

8. Immune Checkpoint Inhibitors

New – Nivolumab
Star – Dostarlimab
Drugs – Durvalumab
Acting – Avelumab
At – Atezolizumab
Immune – Ipilimumab
Check – Cemiplimab
Point – Pembrolizumab – Used in uterine cancer

9. PARP Inhibitors –
- Olaparib, Niraparib – Used in BRCA positive ovarian, fallopian tube and primary peritoneal cancer
- Talazoparib – BRCA positive breast cancer

Blood

ANTICOAGULANTS

Oral

1. DOAC/NOAC (Direct-Acting Oral Anticoagulants/ Novel Oral Anticoagulants)

A. Oral DTI (Direct Thrombin Inhibitors) – Dabigatran

B. Oral Xa Inhibitors – Apixaban, Rivaroxaban, Edoxaban

- Use –
- ✓ DOC for treatment and prophylaxis of DVT
- ✓ DOC for prophylaxis of thrombosis in nonvalvular atrial fibrillation (Except severe mitral stenosis – Warfarin used)
- S/E – Bleeding
- Antidote
- ❑ Dabigatran – Idarucizumab
- ❑ Oral Xa Inhibitors – Andexanet alfa
- ❑ Ciraparantag – Wide spectrum antidote for dabigatran, Oral Xa inhibitors, LMWH, UFH and fondaparinux

2. Warfarin

- MOA – Blocks VKOR – Decrease activated Vitamin K – Decreases
- ❑ Coagulation factors – II, VII, IX, X
- ❑ Anticoagulation factors – Protein C and S

Note: 1st to decline is factor VII followed by protein C and last to decline is factor II

- Use
- ✓ DOC – Prophylaxis of thrombosis in valvular atrial fibrillation (Mechanical Valve)
- ❑ DVT prophylaxis

- S/E –
- ❑ Skin necrosis (Due to decrease in protein C and S)– M.C in limbs
- ❑ Teratogenic – Nasal hypoplasia, Stippled epiphyseal calcifications
- ❑ Purple toe – Bilateral painful purple discoloration of toes due to cholesterol embolization
- ❑ Bleeding
- Monitor PT/INR
- ❑ INR 3 – 10 (No bleeding) – Stop warfarin and restart once INR is normal
- ❑ INR > 10 (No bleeding) – Vitamin K
- ❑ Bleeding – DOC – Prothrombin complex

Parenteral

1. Parenteral DTI (Direct Thrombin Inhibitors)

- Desirudin – Use in DVT
- Bivalirudin – Use in PCI in MI
- Argatroban – DOC HIT

2. Indirect Thrombin Inhibitors

A. UFH – (Decreases factors X and II)

- S/C – Prophylaxis, IV – Treatment
- Multiple doses required – Unpredictable effect – Monitor aPTT
- Antidote – Protamine Sulphate
- Preferred in catheter induced thrombosis and cases where concurrent anticoagulation and thrombolysis required.

- S/E –
- ❑ A – Alopecia
- ❑ H – Hyperkalemia
- ❑ O – Osteoporosis
- ❑ T – Thrombosis, Thrombocytopenia (HIT)

- C/I –
- ❑ T – Thrombocytopenia
- ❑ E – Endocarditis
- ❑ A – Alcoholics
- ❑ C – Cirrhosis of liver
- ❑ H – Hypertension (Severe)
- ❑ E – Eye Surgery
- ❑ R – Renal failure (Only LMWH and Fondaparinux)

B. LMWH – (Decreases factor X>II)

C. Fondaparinux (Decreases factor X only)

- Both – S/C – Prophylaxis and Treatment
- Both dosing – OD
- Preferred more than UFH – DVT treatment and prophylaxis, MI, Pulmonary embolism

Note:

1. Coagulation monitoring not required: DOAC, LMWH and Fondaparinux
2. Coagulation monitoring required
   - ❑ Parenteral DTI, ITI – aPTT
   - ❑ Warfarin – PT/INR

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About the Author

Ranjan Kumar Patel, *MD (Pharmacology)* is a renowned faculty of Pharmacology in India as well as Visiting Faculty in various Medical Colleges based in the countries, like China, Russia, Ukraine, Philippines and many European countries as well. He completed his MD in Pharmacology from University College of Medical Sciences and GTB Hospital, Delhi. Being a topper in AIPG, he opted for Pharmacology which shows his immense love for the subject. His eloquent speaking style and passion for teaching make him very popular amongst the students. He organizes his own classes in pharmacology all over India known as CPR (Conceptual Pharmacology Revision). Every year thousands of students are benefitted from his lectures and they achieve their desired goals.

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