

AN ALTERNATIVE APPROACH TO
EXPERIMENTAL PHARMACOLOGY
A PRACTICAL MANUAL FOR UNDERGRADUATES & POSTGRADUATES

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An Alternative Approach to Experimental Pharmacology by Himanshu Joshi

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OATH

- *Before conducting any experiment on animals, I will always ensure that the life of an animal is valuable. I will first consider all the possible options then prefer alternative methods over animal experimentation and conduct animal experimentation only for the betterment of human society and for the animal.*
- *I will ensure that significant effort is made to reduce the pain and suffering to the experimental animal during the course of experiment.*
- *I will put in all efforts to motivate the scientific community and fellow researchers to be sensitive and have humanitarian viewpoint towards the experimental animals, so that the researchers are considerate towards experimental animals.*
 - *I will be aware of and uphold the basic rights of experimental animals and will be responsible regarding my duties towards experimental animals and shall abide by all the legal and ethical guidelines.*

- LASAI

(Laboratory Animal Science Association of India)

Foreword

Laboratory animal based research is critical in uncovering biological processes within complex living system as well as for pre-clinical testing. To fully realize its potential, this requires standardizing every aspect of animal handling, care, and experimentation, directed towards the purpose of minimizing variability and maximizing contrast between experimental groups. Simultaneously, it is necessary to ensure that appropriate care is taken of the ethical considerations involved in experimentation on a sentient being. This book introduces new researches to the field of laboratory mouse based research and reinforces the basic concepts to those who may have had some experience. Emphasis is provided to practical aspects and to the common pitfalls in experimental techniques. It also briefly covers the relevant legislation governing the subjects in India and the guiding ethical principles. While there is no substitute to supervised training, I strongly encourage people planning to conduct mouse based research to carefully read this book '*An alternative approach to Experimental Pharmacology*' prior to embarking upon actual experiments.

I wish to congratulate Dr Himanshu Joshi for putting together all relevant information related to animal use and alternative on a single platform. This is going to be a ready reckoner for the pharmacology student.



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The book entitled "An alternative approach to Experimental Pharmacology" by Dr. Himanshu Joshi is a successful effort towards the handling, management, animal care, alternatives and welfare issues regarding laboratory animals in a very precise and simple way. Dr Joshi has done a remarkable job in addressing critical issues related to laboratory animals. I am sure the book would be very useful to the students, teachers and reserchers engaged in the field of Pharmacology.

(M. Hoque)

VIEWS OF SOME STALWARTS OF PHARMACY

'This book, true to its title, is an alternative approach to Experimental Pharmacology. There is a lot of information for the students pursuing Pharmacology programs. As described in the book chick and goat tissues will provide alternative models for Pharmacology experiments, obviating the need for animal ethical clearance. It also provides cheap experimental subjects.'

- Dr. K. Sreedhara Ranganath Pai, Professor & Head, Department of Pharmacology, Manipal College of Pharmaceutical Sciences, Manipal University, Manipal.

Dr. Himanshu has included in this book some of the basic experiments traditionally done by students of pharmacology, innovating in design and procedures without hurting the progressive society's ethical concerns and at the same time manipulates viable alternative to the new generation within the ambit of the loss on animal welfare. I am sure that this book will provide new impetus required for the Experimental Pharmacology.

- Dr. D. Satyanarayana, M.Pharm, Ph.D, Emeritus Professor, Vikas Institute of Pharmaceutical Sciences Rajahmundry, A.P.

"Dr. Himanshu Joshi has compiled a manual for the students of Pharmacology. He has nicely packaged the main features of experimental procedures with good illustrations. Inclusion of CPCSEA guidelines and other regulatory aspects will be quite useful for the students. Information about handling of animals and maintenance gives the book wider perspective. On the whole a well compiled book"

- Dr. C.S. Shastry, Principal N.G.S.M.I.P.S Mangalore.

This book entitled “An Alternative Approach to Experimental Pharmacology” provides comprehensive knowledge of pharmacological experiments and also helps in understanding various In-vitro and In-vivo models to carry out the experiments. This book will be definitely useful to students of B. Pharm, M. Pharm and also for the research scholars. It is worth having this book in the library as reference book.

- Dr. Chandrashekar. K.S, Associate Professor, Department of Pharmacognosy, Manipal College of Pharmaceutical Sciences, Manipal.

Your book is an excellent compilation of Experimental Pharmacology. Wonderful lever for lifting tons of pharmacological load. A must for beginners & reference book for experts. Congratulations! You have come up with a work which every P.G pharmacology student should have.

- Dr. M.P Joshi, Professor, Goa College of Pharmacy, Goa.

I applaud publication of your wonderful book entitled “An Alternative Approach to Experimental Pharmacology”. Today the animal studies are almost banned; you have provided a book giving alternative approaches to experimental Pharmacology.

- Dr. Arun. B. Joshi, Professor, Department of Pharmacognosy, Goa College of Pharmacy, Goa.

PREFACE

I never had a plan to write a book, it was a need or demand of the time. Because of the current regulations or proactive participation of regulatory bodies the well established frame work of our regular pharmacology practicals became non-functional.

Progressive society which recognizes animal welfare as one of its ethical concerns came up with new regulations and laws governing experiments on laboratory animals creating a situation to think of a new dimension in experimental pharmacology which had a humane and ethical base. It was a trying time for experimental pharmacology when there was a major shift from animal based experimentation to computer based simulated experiments for teaching that reshaped the pharmacology lab and made a sophisticated computer based lab.

The academia started feeling the void which could never be filled by computer based simulated experiments, which have failed miserably in being a substitute to animal experimentation.

During visits to various pharmacology labs we felt that because of new regulations and new thoughts the people are not in position to follow the well established manual and going away from the traditional pharmacology, a science which is very young started just hundred years back and the results is the new generations is missing the 3E's Exposure, Experience and Expertise which comes with real handling.

In view of these backdrops I decided to fill the gap by collecting the procedures and to design a new lab manual with new word "Alternative Pharmacology" to use tissue materials from slaughter house or from other source and to use some chemical methods to understand the concepts and mechanisms in pharmacology and to provide a viable alternative which could provide the 3E's to the new generation within the ambit of the laws on animal welfare.

Himanshu Joshi
30 May 2015

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I am grateful to almighty for giving me good health and well being to complete the work. I would like to express my gratitude to all the people who are directly or indirectly associated with this work.

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- My dear colleagues especially of the Pharmacology department, lab staff and my present and past students for their support.

Nevertheless, I express my gratitude towards my Father and Mother, in-laws, friends, brother and sisters for their encouragement, support, help and guidance in bringing out this book.

**Dedicated to
My Parents**

LIST OF ABBREVIATIONS

A : Absorption	L : Litre
ACh : Acetylcholine	LD 50 : Lethal Dose 50
AChE : <i>Acetylcholinesterase</i>	M : Metabolism
ATCHI : Acetyl Thiocholine Iodide	MCI : Medical Council of India
ACE : Angiotensin Converting Enzyme	ml : Millilitre
°C : Degree Centigrade	min : Minute
CNS : Central Nervous System	mm : Millimetre
Con : Concentration	Mol.Wt : Molecular Weight
CPCSEA : Committee for the Purpose of Control and Supervision of Experiments on Animals	NMJ : Neuro Muscular Junction
D : Distribution	OD : Optical Density
DMF : Dimethylformamide	PCA : Prevention of Cruelty to Animals Act
DMSO : Dimethyl sulfoxide	P.I : Principal Investigator
DRC : Dose Response Curve	p.o : Per oral
dTC : d-Tubocurarine	PSS : Physiological Salt Solution
DTNB : 5,5'-dithiobis-(2-nitrobenzoic acid)	s.c : Subcutaneous
E : Excretion	sec : Second
ED 50 : Effective Dose 50	SOP : Standard Operating Procedure
EC 50 : Effective Concentration 50	Std : Standard
g : Gram	TI : Therapeutics Index
G : Gauge	TLC : Thin Layer Chromatography
GABA : Gama amino butyric acid	UGC : University Grants Commission
h : Hour	
HEIs : Higher Education Institutes	
5-HT : 5-Hydroxytryptamine	
IAEC : Institutional Animals Ethics Committee	
IBSC/IBC : Institutional Bio-safety Committee	
ICMR : Indian Council of Medical Research	
i.m : Intramuscular	
INSA : Indian National Science Academy	
i.p : Intra peritoneal	
i.v : Intravenous	
IVC : Individually Ventilated Cages	

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